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ACORN USER

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JUNE 1993



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ISSN 0263-7456
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SCSI systems The complete

CD ROM Systems

Our CD ROM systems comprise of a Toshiba mechanism (Multisession - Photo CD compatible), a Morley SCSI card, a set of stereo speakers and four collections of discs to choose from (see below). The software on these discs is all RISC OS software and requires no use of a PC emulator whatsoever.

Collection 1	£649.00
(Grooves, Creepy Crawlies, Image Warehouse)	
Collection 2	£729.00
(Grooves, Creepy Crawlies, Image Warehouse and Hutchinsons Encyclopedia)	
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(Grooves, Creepy Crawlies, Image Warehouse and Dictionary of the living world)	
Collection 4	£849.00
(Grooves, Creepy Crawlies, Image Warehouse, Hutchinsons Encyclopedia and Dictionary of the living world)	
CD ROM Drive & SCSI Interface	£489.00



Hard Disc Systems

The Morley Hard Disc systems comprise of a SCSI card together with all the necessary cables, SCSI management software, Hard Disc and a detailed manual. Effectively giving the user a 'plug in and go' solution to Hard Disc storage Many of our existing customers have commented about how easy it was to connect their Morley Hard Disc to their computer.

External Hard Discs are housed in an attractive metal case with dual SCSI connectors and device ID switch already fitted. As with all of our SCSI cards CDFS is installed as standard.

A3000 or External 40Mb	£349.00
A3000 or External 80Mb	£499.00
A3000 or External 240Mb	£709.00
A300/400/5000 Internal 40Mb	£269.00
A300/400/5000 Internal 80Mb	£449.00
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Syquest Hard Discs

Our removable Cartridge Hard Disc systems are designed to offer the end user the ultimate in terms of portable, mass storage. The systems come in a choice of either 42Mb or 88Mb sizes (non interchangeable). With the benefit of a small on-board cache the mechanisms offer superb performance with transfer rates exceeding that of many standard fixed hard discs.

The biggest advantage of these systems is that when a cartridge is full, you simply have to insert a new cartridge and you have another full 42Mb or 88Mb to play with.

All systems

42Mb system	£499.00
88Mb system	£775.00
(Both include SCSI Interface & one cartridge)	

Consumables

42Mb Cartridges	£65.00
88Mb Cartridges	£109.00



from Morley. solution.

Tape Archive

Tape archive systems tend to be regarded as expensive add ons to an Acorn system. The part that people tend to forget about is how valuable is their data? If you manage a network just think how much time and cost would be wasted if the hard disc failed without you having a recent back-up. Using standard floppy discs for back-up is one option but is incredibly tedious if large amounts of data are invloved.

The answer is a Morley Tape Archive system. With every system sold we supply a FREE copy of SAS (Safe & Sound) archiving software to make backing up and restoring as simple as possible. Don't get caught out!

External 250Mb system	£799.00

(Includes SCSI Interface & one 250Mb tape)

Consumables

250Mb Tapes	£24.99
150Mb Tapes	£19.99



Floptical® Systems

The new Floptical® system has been developed in the USA by Insite Peripherals of California while the drives are being manufactured by Matsushita of Japan (one of the worlds largest electronic manufacturers). 3M and Hitachi are currently producing the special 21Mb discs which give this incredible amount of storage. Morley have developed the drive for use on the Acorn range of RISC OS computers and this can now read and write standard 800k and 1.6Mb floppies as well as the 21Mb Floptical® discs. Using the 21Mb discs these drives are approximately twice as fast as normal floppy drives making them perfect for use as a backup system or general purpose program/data storage.

External 21Mb system	£499.00
A5000 internal 21Mb system	£425.00

(Both include SCSI Interface & one disc)

Consumables

21Mb disc each	£24.00
Pack of 5 x 21Mb discs	£99.00



Other Prices

RISC OS CD ROM DISCS

Creepy Crawlies (MDI)	£99.00
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Subscriptions and back copies: (0483) 727762
Annual subscription rate: £22.95 including our exclusive monthly subscriber's disc
Reader services department: 071-331 8022

Published by Redwood Publishing, a BBC Enterprises Company, 101 Bayham Street, London NW1 0AG. Tel: 071-331 8000. Fax: 071-331 8001. Typesetting and colour by Trumps Studio, Ware, Herts. Printed by Cradley Print Ltd, West Midlands. Distributed by BBC Frontline, Park House, 117 Park Road, Peterborough.

Redwood Publishing is a registered data user. ISSN 0263 7456.

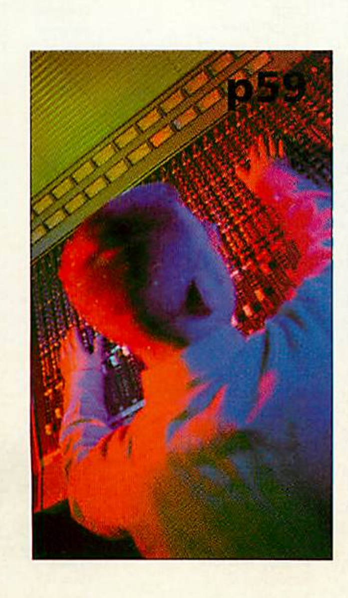


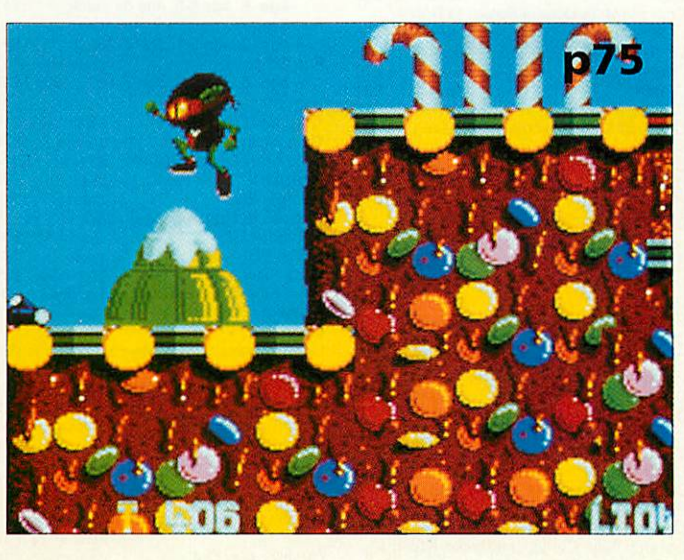
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JUNE 1993

FEATURES

HANDS ON





EDITOR'S LETTER

Computer graphics has changed the popular perception of art. People who wouldn't be seen dead in front of an easel, have taken to this new form of creativity, thanks to the growing range of sophisticated graphics packages on the market.

Making your choice between vector graphics – found in packages such as *Artworks* – or the painting effects of the bitmap approach – with applications such as *Revelation Image Pro* or *ProArtisan 2* – is just one of the decisions to make when choosing a new art package.

In our round-up on page 15 we aim to show you what some leading Acorn packages are capable of. It's all a long way from the early days of *Artisan*, first reviewed in *Acorn User* in 1988.

Of course, the current state of Acorn art is by no means the end of the story: 24-bit colour is on the agenda, and Risc technology is working at the leading edge of graphics developments.

Last month's report from *Imagina* showed 64-bit Risc chips running at up to 150Mhz. This allows the kind of animation techniques found in today's film industry and makes Risc technology the name to watch in computer graphics.

Karen Donaphay

Editor

EXCLUSIVELY PRODUCED ON ACORN MACHINES

All the editorial pages in *BBC Acorn User* are produced using Acorn computers, Computer Concepts' *Impression 2*, LaserDirect printers and Taxan monitors



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Science, drawfiles *Micro Studio* £25
Score Draw *Clares* £44
Scorewriter *EMR*
– PMS Dot matrix, Version 1 £127
– PMS Dot matrix, Version 2 £147
– PMS PostScript £422
ScreenPlay *Widgit* £35
ScreenTurtle *Topologika* £44
Search and Rescue, age 9+ *Storm* £27
Seashore Guide, drawfiles *Micro Studio* £16
Seelinks – Ourselves, KS1,2 *ESM* £29•
Seelinks – Pond Watch, KS2 *ESM* £37•
Seelinks – Transport, KS2 *ESM* £37•
Serenade *Clares* **£106•**
Sesame Street *Electric Crayon*
– Letters for You £16
– Numbers Count £16
ShapeFX *Data Store* £10
ShareHolder *Silicon* £106
ShareHolder Professional *Silicon* £234
Shylock Gnomes, age 10-15 *Selective* £16
Sim City *Krisalis* **£24**
SkyHunter *Longman* £22
smArt *4mation* £50
smArt Aliens, Animals, Dinosaurs, Egypt, Faces*, Fantasy, Fashion, Fiddles & Drums, Heraldry, Homes*, Leisure*, Look Smart, Smartoons, Trees and Gardens *Please specify English, French, German, Spanish or Welsh – each *4mation* £15
smArtFiler *4mation* £32
smArt Modern Languages *4mation* £19
Smudge the Spaniel, age 4-8 *Storm* £20
Snippet (new version) *4mation* £32
Soapbox *Xavier* £34
SolidCAD *Silicon* £79
SolidsRender *Silicon* £79
SolidTools *Silicon* £234
Sound Engineer *EMR* £69
Sound FX Maker *CIS* £31
Sounds & Rhymes *Xavier* £29•
Spark *David Pilling* £5
SparkFS *David Pilling* £20
Sparkle *Morley* £59
Special *ICS* £10
– site licence £30
Speech! *Superior* £14
Spelling week-by-week *Chalksoft* £21
Spex *ExpLAN* £98
Spheres of Chaos *Matt Black* £19
Splash, age 7-11 *Sherston* £19
Splice *Ace* £29
Split an Image *Sherston* £15
Spoken Word *Wyddfa* £16

Spooler *Computer Tutorial* £9
Sporting Triangles *CDS* £19
SportsDay *Selective* £22
SportsPeople *Selective* £22
SpriteEd *Computer Tutorial* £17
SpySnatcher *Topologika* £12
Square Route *Computer Eyes* £16
Starspell Plus *Fisher-Marriott* £19
StartWrite *Icon* £55
Stock Management *Minerva* £78
StockPack *Topologika* £37
StrongED *Stallion* £22•
Studio24Plus Version 2, age 11+ *EMR* £149
Studio24Plus Version 3, age 12+ *EMR* £210
SUMthing *Resource* £19
SuperDump *Silicon* £20
Superior Golf *Superior* £14
SuperPlot *Silicon* £20
Supersounds *CIS* £15
Supersounds 2 *CIS* £15
Swiv *Krisalis* £19
System Delta Plus II *Minerva* £50
– Reference Guide *Minerva* v0 £25

TABS *ExpLAN* £95
Talisman *Minerva* £8
Talking Pictures *Wyddfa* £16
Target Maths *Triple R* £15
Technodream (Nevryon 2) *Superior* £20
TechWriter *Icon* £159
Thinklink *Xavier* £29
ThinkSheet *Fisher-Marriott* £38
Thundermonk *Minerva* £11
Tiles *Brain Games* £16
Timeshare *Fisher-Marriott* £19
Timetabler *Minerva* £549
Time Traveller, KS2 *ESM* £37•
– Britain Since the 1930s, KS2 £32•
– The Victorians, KS2 £32•
TinyLogo/Draw *Topologika* £34
TinyPuzzle *Topologika* £24
Titler *Clares* £119
Toolkit Plus *Clares* £36
Tools Graphics, drawfiles *Micro Studio* £23
Topographer *Clares* £67
Touch Type *Iota* £39
Tower of Babel *Cygnus* £17
Trace *David Pilling* £5
Tracer *Midnight* £46
Tracker *Leading Edge* £37
Transport, drawfiles *Micro Studio* £25
Turbo Type *CIS* £20
Tween *Ace* £28
Twin *Acorn* £24
Twin World *UBI Soft* £14
TWO (Task and Window Organiser) *ICS* £10
– site licence £30
TypeStudio *RISC* £39

Utility Disc 1 *Data Store* £8
Utility Disc 2 *Data Store* £13
Utility Disc 3 *Data Store* £7
Utility Collection *Data Store* £21

Vector *4mation* £75
View»Mac 3 *Human* £65
– Arc/Mac Cable *Human* £24
Viewpoints, age 7-12 *Sherston* £37
Vox Box *Clares* £46

Waterloo (not OS 3.1) *Turcan* £19
Whale Facts *Topologika* £34
WindowEd *Armen* £27
Word Bank *Topologika* £25
Words and Pictures *Chalksoft* £18
WordWorks *CC* £38
Wordz *Colton* £89
World Geography Maps, draw *Micro Studio* £23
World Map Study, age 7-16 *ESM* £42
Worldscape *Leading Edge* £17
World Wildlife, sprites *Micro Studio* £16
Worra Battle *Oak* £15
WorraCAD *Oak* £79

Yacht 2 *Computer Tutorial* £49
Yacht 7 *Computer Tutorial* £94

Zarch *Superior* £14
Zelanites (not OS 3) *Micro Power* £15
Zool *Gremlin* £21•

HARDWARE

MEMORY . . .

† Fitting extra unless otherwise stated
† Fitting easy ‡ Fitting needs expertise

A3000 2 Mb Upgradable †*Atomwide/IFEL* £45
A3000 4 Mb † *Atomwide/IFEL* £110
A3010 1-2 Mb £39
A310 2 Mb Upgradable soldered ‡ *IFEL* £88
– as above + MEMC1a £124
– as above + MEMC1a + fitting £154

ICS

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A310 4 Mb soldered + MEMC1a ‡*IFEL* £180
– as above + fitting £210
A5000 2-4 Mb Non-upgradable† *Atomwide* £85
A5000 2-4 Mb Upgradable † *Atomwide* £99
A5000 2-8 Mb including fitting *Atomwide* £500
A5000 4-8 Mb including fitting *Atomwide* £391
A540 4 Mb † *Acorn* **£253•**

COMPUTERS . . .

A3010 1MB FD Family Solution *Acorn* £420
Family Solution + ideA
Special price when you buy an A3010 with an ICS internal hard disc upgrade:
– Family Solution + 20 Mb hard disc £599
– Family Solution + 60 Mb hard disc £675
– Family Solution + 80 Mb hard disc £715
– Family Solution + 120 Mb hard disc £799
A3010 2MB FD Learning Curve with Monitor *Acorn* £675
– as above + JP150 Printer £889
A3020 2MB FD *Acorn* £749
A3020 2MB HD60 *Acorn* £899
A4 2MB FD *Acorn* £1395
A4 4MB HD60 *Acorn* £1695
A4 4MB HD80 *Acorn* **£1699**
A4 4MB HD120 *Acorn* £1799
A4 Extra Battery Pack *Acorn* £50
A4 Shoulder Bag *Acorn* £35
A4000 2MB HD80 *Acorn* £945
– as above + Home Office £995
A5000 2MB HD80 Multiscan *Acorn* £1395
– as above + Learning Curve £1455
Pocket Book *Acorn* £212

MISCELLANEOUS. . .

386 PC Expansion Card 25 MHz *Aleph One*
– 1 Mb £374
– 4 Mb £468
486 PC Expansion Card *Aleph One*
– 1 Mb £463
– 4 Mb £557
4-slot 4-layer Backplane *IFEL* £57
9060S Monitor *Eizo* £450
A300/400 Fan kit *ICS* £15
A3000 Expansion Box *Wild Vision* £135
A310 RISC OS Carrier Board ‡ *IFEL* £21
A5000 Fitting Kit for second hard disc *ICS* £15
Arckey Function KeyStrip Holder *ICS* v0 £3
– pack of 4 v0 £10
ArcNET *ACS* £69
ARM3 ‡ *Aleph One/IFEL* £175
ColourBurst *State* £322•
ColourCard *CC* **£225**
– A3000 External *CC* £225
Dongle Dangle with screw fittings *ICS* £6
Fan filters (pack of 10) (not A5000) *ICS* £6
FaxPack *CC* £289
Floppy Discs, 10 × 3½" High Density £10
G16 *State* £258•
G8 Plus *State* £238
G8 Plus Video Switch *State* £23
HiPoint Mouse for A4 *Genius* £49
Micro Mouse *Clares* £26
Monitor Stand for A3000 *ICS* £21
Podule Case for A3000 *HCCS* £16
RISC OS 3 Upgrade *Acorn* £42•
– Bulk package *Acorn* £335
– A5000 *Acorn* £19•
Seal 'n Type spill-proof Keyboard Covers
– Archimedes / A5000 *Kador* £14
– A3000 *Kador* £14
TouchWindow *Lindis* £234
Whisper Fan Quietener (for A300/A400 series only) *ICS* £15
Wizzo IDE Filing System on rom *ICS*
– **Wizzo4** for A4 **£29**
– **Wizzo5** for A5000 **£29**

For ordering details please turn to page 3



051-625 1006

I²C PRODUCTS . . .

AnDi Oddule	Baildon	£39
I²C Adaptor (needed unless you already have an I²C socket)	Baildon	£10
I²C SWI (enhanced IIC_Control)	Baildon	£15
– bought with Oddule		£5

PRINTERS . . .

ArcLaser 300-6	Calligraph	£895
ArcServer 300-8	Calligraph	£985
Bubble Jet BJ-10ex	Canon	£187
Bubble Jet BJ-10ex + TurboDriver	Canon/CC	£219
Bubble Jet BJ-20	Canon	£255
Bubble Jet BJ-200	Canon	£282
Bubble Jet BJ-300	Canon	£325
Bubble Jet BJ-330	Canon	£405
Bubble Jet **BJC-800+Turbo-Driver**	Canon/CC	**£1374**
DeskJet 500	Hewlett-Packard	£299
DeskJet 500C	Hewlett-Packard	£375
DeskJet 550C	Hewlett-Packard	£475
Laser Direct HiRes4	CC	£899
– 250-sheet Paper Cassette		£99
Laser Direct HiRes8	CC	£1275
Laser Direct HiRes Board	CC	£325
Refill toner cartridge for Canon EPS		£50
New toner cartridge for Canon LBP-4		£59

SCANNERS, DIGITISERS . . .

ArcScanner including Epson GT-4000	Clares	£1660
Colour Converter	Lindis	£145
FaxScan	Spacetech	£94
Handipad	TechSoft	£173
Hawk V9	Wild Vision	£199
– A3000 version	Wild Vision	£278
Hawk V9 MkII	Wild Vision	£259
HiVision Digitiser Colour	HCCS	
– A3000 External		£137
– A3000 Series / A4000 Internal		£124
– A5000 / 300 / 400		£124
– Upgrade from Vision		£45
iMage (Sharp JX-100)	Irlam	
– for A5000		£490
– for other computers		£589
Image Scanner	Iota	£383
– Colour Upgrade Kit	Iota	£239
– Fast Parallel Card	Iota	£98
i-Scan 200	Irlam	£539
i-Scan 400	Irlam	£589
Pineapple Colour Video Digitiser	Pineapple	£195
– A3000 boxed	Pineapple	£230
ProImage (Epson GT6000)	Irlam	
– for A5000		£989
– for other computers		£1089
Scan-Light A4	CC	£277
– with Sheet Feeder	CC	£360
Scan-Light 256	CC	£190
– A3000 internal	CC	£190
Scan-Light Professional	CC	£565
– as above + SCSI interface	CC	£699
SnapShot Colour Video Digitiser	Lingenuity	£195
– A3000 version	Lingenuity	£275
Spectra	RISC	
– Archimedes / A5000		£545
– A3000 Series / A4000 Internal		£545
– A3000 External		£555
Vision Digitiser	HCCS	
– A5000 / 300 / 400 Mono		£48
– A5000 / 300 / 400 Colour		£76
– A3000 External Mono		£60
– A3000 External Colour		£89
– A3000 Series /A4000 Internal Mono		£48
– A3000 Series / A4000 Internal Colour		£76

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All products, prices and specifications are offered in good faith and are subject to change without notice. We process all orders immediately, but suppliers do sometimes keep us waiting. Goods are guaranteed but we do not supply them on approval. Returns and cancellations can only be accepted by prior agreement and there may be a charge to cover the costs involved.

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LICENSED CREDIT BROKER



ACORN KILLS OFF BBC MASTER 128

AFTER more than seven years, Acorn is to cease production of its last eight-bit computer, the Master 128.

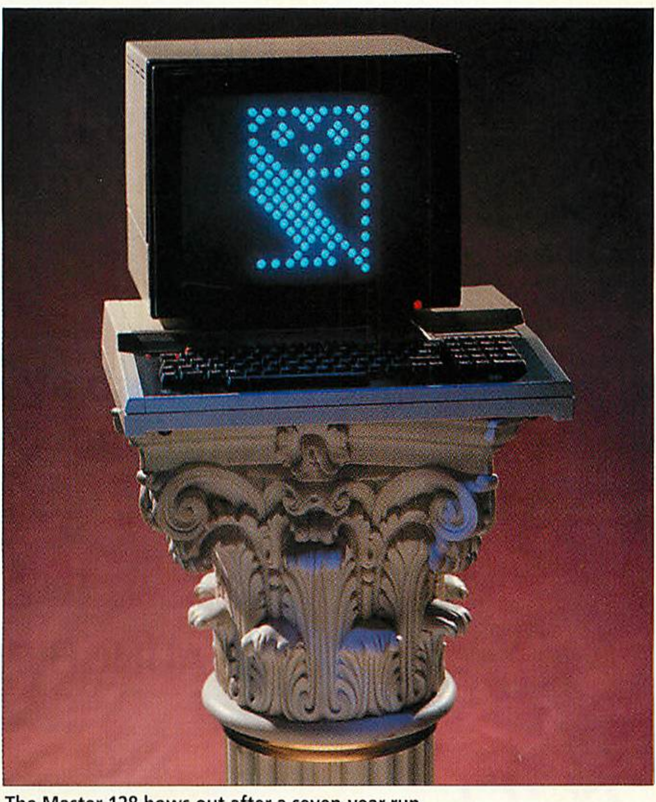
Although there is still a steady, if small, demand for the Master 128, Acorn says that the machine is now uneconomical to produce and that key components are now becoming scarce.

The demise of the BBC Master brings an end to the illustrious eleven-year story of the BBC Micro. During this time, over a million derivatives were built and sold all over the world.

Long after the arrival of the Archimedes, people still wanted the Master 128 because of its competitive price, the range of standard interfaces, BBC Basic and the sturdiness of the machine.

History may reveal that the Master 128 kept Acorn afloat while the company tried to re-establish itself with the new and unproven Archimedes.

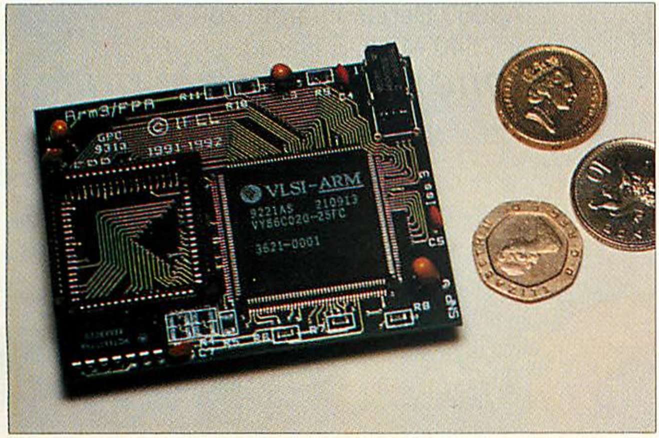
But, as Acorn's marketing director, Mike O'Riordan, pointed out, the Beeb is far from dead. 'The Master has contributed greatly to Acorn's success and will continue to be used for key applications within the classroom for many years,' he said. O'Riordan added that Acorn will continue to provide spare parts for the Master 128 for at least five more years.



The Master 128 bows out after a seven-year run

FPA FLOATS THIS WAY

THE Floating Point Accelerator could arrive by the end of June. GEC Plessey Semiconductors is at an advanced stage of production. The FPA chip will boost the performance of many maths-intensive programs at present performed by the Risc OS Floating Point Emulator. Several manufacturers, such as Ifel and Simtec, have been selling Arm3 upgrades with empty sockets ready for the FPA. Certain Archimedes, like the A5000 have FPA sockets as well.



The hole in this Arm3 upgrade could soon be filled by the FPA chip

HCCS REFIT

POTENTIAL buyers for the Ultimate Expansion System from HCCS can be put off if they own A3000 or A3010 computers. The space in these models may already be taken up by an IDE hard drive.

To counter this, HCCS has come up with a service to remove and refit these hard drives to the Ultimate Expansion System unit. The new unit will then be fitted into the customer's machine.

Most makes of drive except HCCS's own Diamond brand will require re-formatting, so data will have to be backed-up before the refit takes place.

HCCS reports that its Ultimate Expansion Trade-up scheme has already been taken on by a selection of Acorn dealers. For more details on the deal give HCCS a call on 091-487 0760.

IN BRIEF

- Beebug has published an eight-page pamphlet aimed at people who want to get to grips with Econet networking over Ethernet networks, otherwise known as the Acorn Universal Network system. The pamphlet is called *An Introduction to Networking* and covers topics like extending established networks, starting new installations and hardware/software familiarisation. The pamphlet is available free of charge from Beebug.

- The latest edition of Beebug's full-colour Product Guide brochure has been published, featuring brief descriptions of over 2500 selected product lines. The Beebug Product Guide is free of charge from Beebug on request. For more information contact Beebug on (0727) 840303.

- Andrew Timms, the 14-year-old *Acorn User* reader who launched the Children's *Acorn User* Club late last year, has decided to make a go of marketing his own Archimedes applications. Andrew says his first commercial title will be *ModSys*, short for Module System.

  This is a utility for incorporating short, user-written, desktop utilities into a master control application. Andrew thinks he will charge between £5 to £10 for *ModSys* when it is finished. 'I'm not desperate for a profit, I just want to write useful applications,' Andrew said. For more information, contact Andrew Timms at 109 Woodland Drive, Cassiobury, Watford, WD1 3DA.

- Longman Logotron has launched *Talking Pendown*, the speaking version of its popular schools-oriented word processor. *Talking Pendown* is entirely software-controlled and the speech facility can be switched on and off as desired. Longman expects the package to be useful for users of all ages and abilities, but especially users with below average reading levels and dyslexics. *Talking Pendown* is £64 but registered Pendown users can upgrade for half price. Discounts for site licence holders are also available. Contact Longman Logotron on (0223) 425558.

PETER DAZELEY



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SUCCESS STORY OF SPRING SHOW

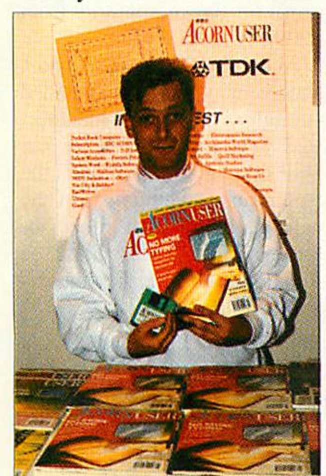
THE first *Acorn User* Spring Show held recently at Harrogate was declared a success by event organiser Geoff Potter of Safesell Exhibitions. Fifty exhibitors attracted 5,000 visitors over the three-day event and next year's show looks set to be bigger still.

Exhibitor feedback was extremely positive after the show. Computer Concepts told us the long journey north was well worth the trip.

Rob MacMillan from Colton Software admitted he wasn't entirely convinced the show was going to be a big success, but on the day his worries proved unfounded.

'We'd definitely like to be there again next year,' he said. Several other exhibitors were forced to make special trips back to base for extra stock.

Special events hallmarked the show. Dominik Diamond, presenter of hit Channel 4 computer game show *GamesMaster*, toured on Friday to the delight of games fans.



The smiling face of Acorn User



Crowds enjoy the Acorn User Show at Harrogate

● The next major Acorn show will be Acorn World '93, to be held at the Wembley Exhibition Centre from 29 to 31 October. *BBC Acorn User* is sponsoring the show, which looks like it will be the biggest Acorn show ever staged.

The initial response has been so overwhelming that additional space has had to be booked at Wembley to accomodate the number of anticipated exhibits.

ACORN TARGETS GERMAN MARKET

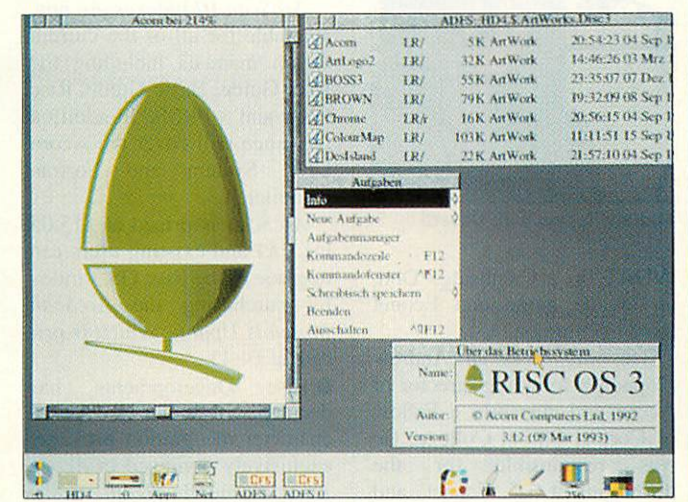
ACORN had an impressive presence at this year's huge CeBIT information technology exhibition in Hannover.

CeBIT attracted 660,000 visitors this year, and Bob Coates, Acorn's general manager for business development, headed up the stand team with managing director Sam Wauchope. According to Coates, Acorn sees great potential in the German market.

'The existing German market leaders are in a bit of a mess right now,' said Coates. 'Commodore and especially Atari are failing to maintain their customer support. Developers are becoming increasingly disillusioned and so they are looking for new platforms. Many have come over to our stand and were very impressed with what we had to show them.'

The highlight for Acorn was the unveiling of an enhanced German-language version of Risc OS 3. The new version of the operating system is release number 3.12 and incorporates Acorn's new stylish 3D window sprites plus an option to replace standard system font on the iconbar and menus with outline fonts. The go-ahead was given because German system messages and menu items forced Acorn to use larger Roms.

Acorn is not able to say when Risc OS 3.12 will be released in English.



The German-language version of Risc OS 3.12

IN BRIEF

● Minerva showed its new *ProCAD* drafting package at the recent CadCam Show at the Birmingham NEC. Orders were taken from a variety of customers, from British Steel to the Ministry of Defence. Minerva is also exploring the avenue of marketing *ProCAD* as part of a complete Cad system.

● The tragic death of programmer Ricky Delarre in a motorbike accident has forced Clares to delay the release of its new mapping program, *Topographer* (reviewed on page 52). Colleague Ian Robinson has taken on the task of completing *Topographer*.

● Arm chips are to be used in more Newton PDA related products. Motorola, Matsushita and Siemens have all won licences to develop Newton-compatible products. It was also announced that another chip maker, Cirrus Logic, will work with Apple and Arm Ltd to develop support chips. At the CeBIT show, Siemens and Apple demonstrated a docking station which enables a Newton to make telephone calls and send fax messages. Sharp, the third licensed manufacturer of Arm chips, also showed its prototype Newton-compatible.

● More Tesco Computers For Schools vouchers are up for grabs. Children hoping to earn their schools some new Acorn equipment are invited to enter a competition sponsored by the *DJ Kat Show* on Sky One. All they have to do is create a meal or picnic for DJ, in the form of a collage, painting or 3D model. Entries must be received by 26 May. Please send them to Computers For Schools, *DJ Kat Show*, PO Box 24, Isleworth, Middlesex, TW7 5QJ. The winner, to be announced on 8 June, will receive all the vouchers a mystery celebrity manages to grab from a specially designed wind machine. The scheme has been such a success this year that schools throughout the UK have been given three extra weeks, until 13 June, to collect vouchers. Last year the scheme ran for eight weeks, but this year the extension brings it to 15 weeks. The closing date for the receipt of the vouchers and order forms remains at 2 July.

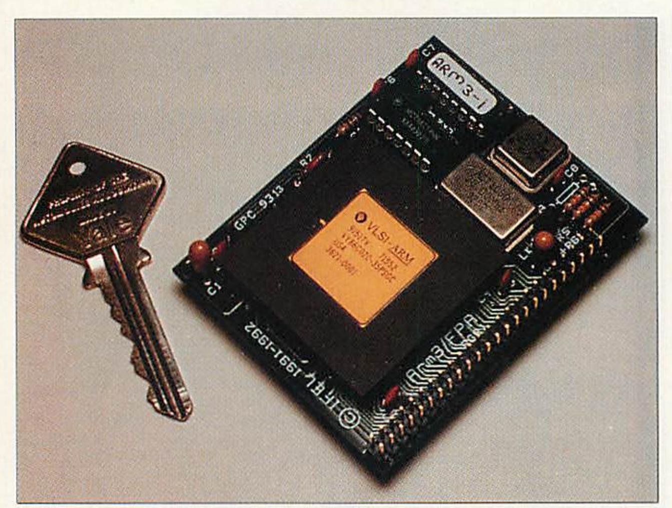
IFEL ULTRA-FAST ARM3 UPGRADE

IFEL showed an ultra-fast Arm3 upgrade at the *Acorn User* Spring Show.

Like Ifel's existing Arm3 upgrades, the new device combines an Arm3 processor with the option of adding the floating point accelerator when it is released. The difference is that Ifel intends to offer the much faster 35MHz Arm3.

At 35MHz an Arm3 gives, typically, 15% better performance than a 25MHz part. However, it is unlikely that the FPA chips will operate reliably at the 35MHz clock rate, so a small switch is provided to select between 25MHz and 35MHz clock crystals.

Another problem is that the 35MHz Arm3 comes in a heavy-duty ceramic PGA chip package instead of the compact surface-mounted form of the standard Arm3. If it goes into production, the 35MHz Arm3 upgrade will only be available for 300, 400 or R140 series Archimedes because of space limitations.


Ifel's bigger and faster 35MHz Arm3 upgrade

At first it was assumed that few of the 35MHz Arm3 parts had been made. It is now clear that though the supply is finite there will be roughly 1500 of these available. Ifel has not yet decided whether it will put the 35MHz Arm3 with FPA into production – it depends on whether customers are sufficiently enthusiastic to make it worthwhile.

The target price Ifel has set is £199 inc VAT. For further information contact Ifel on (0752) 847286.

ACORN RESULTS

ENCOURAGING financial results to 31 December 1992 have been revealed by Acorn. At the same time Acorn's chairman Ernesto Musumeci has been painting a rosy picture of Acorn's prospects in the 1993 financial year.

Turnover rose from £40.9M to £48.2M, an increase of almost 18% during a period in which most other computer manufacturers have been struggling. Operating profit was up by 40% to £1.53M. Net profit for the year was up from £300,000 to £1.3M.

According to the chairman's statement, Acorn maintained strong margins. Musumeci said new technology like the VidC20 video chip and the continuing development of the new Arm700 Risc processor by Arm Ltd. These could be foundations of the next-generation Archimedes.

PINEAPPLE LINK-UP

A NEW connector is able to link the most recent Acorn machines to both the Pineapple video digitiser and future Pineapple hardware.

Pineapple's Mini Expansion Adapter/2 (MEA/2) is aimed at the A3010, A3020 and A4000.

Other A3000-compatible external podules like scanners and cards, should also work.

The device almost duplicates the A3000 external expansion interface. The main difference is that the new bus is eight bits wide compared to the original's 16-bit bus. Pineapple says this affects very few peripherals.

Pineapple is also to renew production of its Archimedes RGB-to-Pal video coder, due to unexpected public demand. The coder was originally wound down in readiness for the new genlock card.

The composite video version of the PLC/2 is £69 + VAT; the S-VHS version is £10 extra. The MEA/2 interface is £28 + VAT. Call Pineapple on 081–599 1476.

HOPPER TO OLIVETTI


Andrew Hopper joins Olivetti

WHAT do a Cambridge Don, an arcade game and Econet have in common?

The answer is Dr Andrew Hopper, a founding director of Acorn and currently a Fellow of Corpus Christi College. He was responsible for the development of Econet and provided the inspiration for a game called *Hopper*.

This month he celebrates his appointment as head of Olivetti's corporate research. Although Hopper has not been on the Acorn payroll for some time, he has retained close links with Acorn.

RISC DEVELOPMENTS ROUND-UP

THE latest addition to the *ArcScan III* index system is the Risc OS 3 Programmers' Reference Manual.

ArcScan III indexes are now available for all of the current Acorn manuals including the User Guide, Basic Guide, Risc OS 2 and 3 PRMs. In addition the range will cover the Acorn DDE System and Fortran compiler.

ArcScan is priced at £15.05 inc VAT and existing users can upgrade to the Risc OS 3 index by purchasing the *ArcScan Manuals Update,* which is priced at £4.45.

● Risc Developments has decided to call its optical character recognition package, exclusively reviewed in *Acorn User* last month, *Sleuth*.

The package is designed to 'read' and then to translate into plain Ascii, pages of text which have been scanned in either by an image scanner or a fax machine. The price of *Sleuth* has been confirmed by Risc Developments at £49+VAT.

● A revised edition of the book *Wimp Programming for All* has been published by Risc Developments.

Additions to the book, which is a detailed introduction and tutorial to programming Risc OS compliant applications in Basic relate to the arrival of Risc OS 3.1. Previously the book concentrated on Risc OS 2, and only covered Risc OS 3 briefly.

To complement the book, a £4.95 supplementary examples disc is also available.

● *Wimp Programmer's Toolkit* is Risc Developments' suite of a dozen Risc OS Wimp development programs.

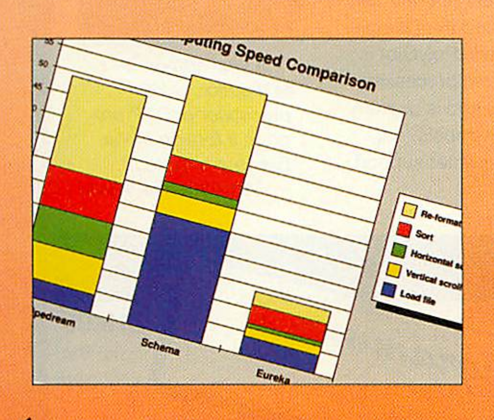
It has now been bumped up to include the latest version of Acorn's template editor *FormEd* version1.26.

The *Wimp Programmer's Toolkit* is priced at £19.95 and existing users can upgrade to it by returning their original disc with £2 to cover post and handling.

Risc Developments can be contacted on (0727) 840303

THE AWARD-WINNING

ΣUREKA!

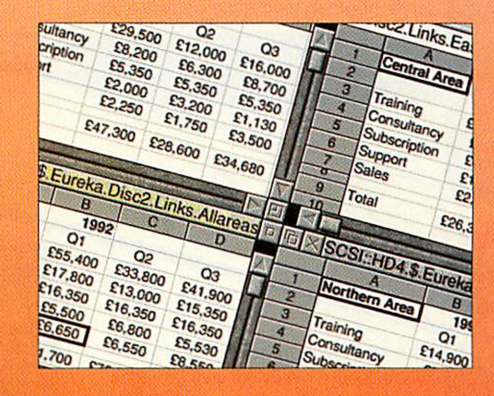


'Eureka will immediately become my first choice of spreadsheet: it will be a tool I use everyday.'

Graham Bell, Acorn User

'Eureka has the edge for speed over its rivals'

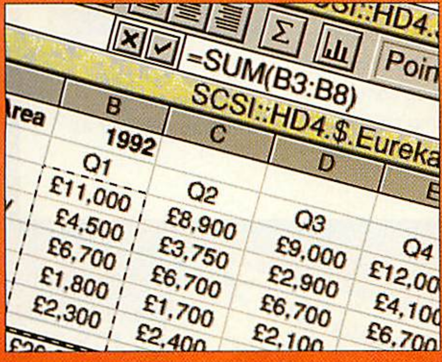
Clem Vogler, Acorn Computing

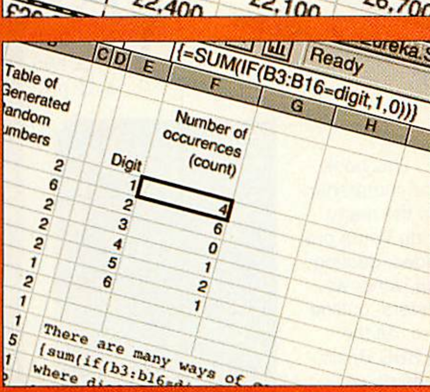


'Eureka does for numbers what Impression does for words. A highly polished and powerful spreadsheet'

James Hope, Computer Shopper

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Crisp and accurate business charting.

Export both worksheets and charts as draw files.

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Array arithmetic for power users.

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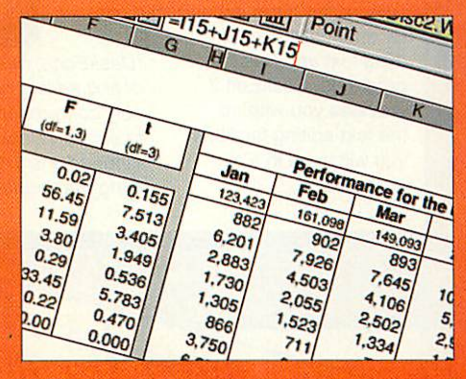
Point and click formula construction.

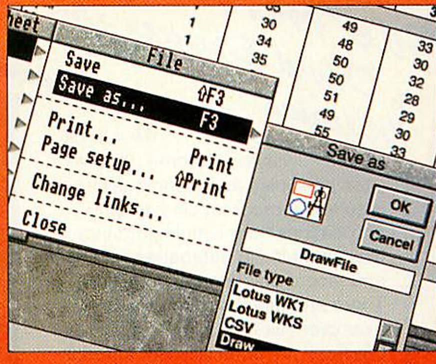
Intersheet linking, for consolidated 3-D models.

Over 4 million cells per worksheet.

SimpleSum for first time users.

Setting new standards of performance, useability and value for all RISC OS users.







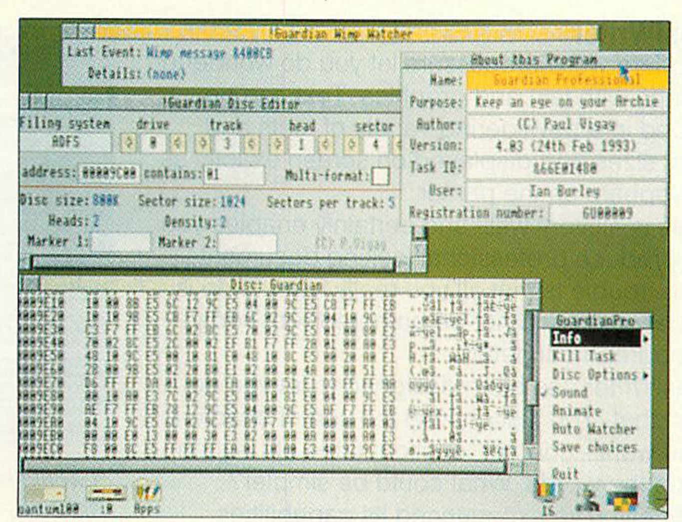
Eureka — £119 for Single User version
£400 Educational Site Licence
£600 Business Site Licence (per 16 users).

124 Cambridge Science Park, Milton Road, Cambridge CB4 4ZS
Tel: (0223) 425558 Fax: (0223) 425349

PROFESSIONAL PROTECTION

GUARDIANPRO, a new commercial version of the PD anti-virus program *Guardian*, has been released by Digital Phenomena. Continual background protection from over 25 different kinds of Archimedes virus is provided.

The system will warn the user if any viruses are spotted, and identified viruses can be eliminated automatically or simply brought to the user's attention. A suite of disc utilities including a hard disc backup routine and disc sector editor are also included. *GuardianPRO* is priced £9.95 from Digital Phenomena on (0705) 871530.



GuardianPro kills all known living germs

CHEAPER DTP PACK

COMPUTER Concepts has announced a price reduction on The Publishing Pack, which will save you £220 on the recommended retail price of the products when purchased separately.

The package was announced at the *Acorn User* Spring Show and includes a Canon BJ-200 bubble-jet printer, a ScanLight 256 hand scanner and *Impression Junior*.

The Computer Concepts *TurboDriver* for the BJ-200 is also included in the price, to enable fast quality printouts to be made.

The scanner component of the bundle has been in short supply recently, but supply problems have now been resolved. The total price of the Publishing Pack is £585.15 and it was a popular choice at the show.

For details contact Computer Concepts on (0223) 63933.



DTP need not cost the earth

POCKETBOOK TOOLS

WIDGET Software has released an enhanced version of its *Series 3 Tools* package. Although intended for the Psion Series 3 electronic organiser, this software is also compatible with the Acorn Pocket Book.

Originally, *Series 3 Tools* featured just a file manager and unit conversion utility. The new version adds a power checking utility to indicate how much battery life is left, plus a task managing utility which is best described as an enhanced 'to-do list' application.

Series 3 Tools is priced at £49.95 including VAT. For further information contact Widget on (0438) 815444.



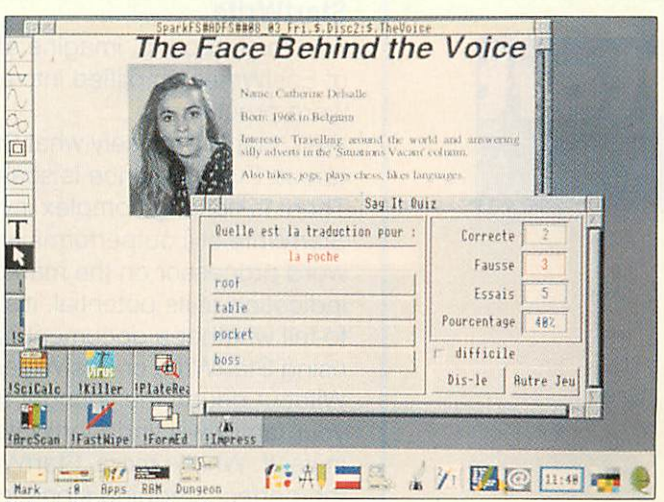
Power checking on your Pocket Book

SAY IT IN FRENCH

SAYITQUIZ is a another interesting new foreign language utility from Bits 'n' Bytes. The program contains a selection of digitised, rather than synthesised, spoken French words and phrases.

The text is spoken by a French native, and is used as part of a multiple choice vocabulary test. Different levels are available for more advanced students and there is a headphone mode for classroom use.

Even better, the program is shareware and registration only costs a fiver. Contact Mike Smith on (0752) 667599 for more details.



Ah! Le desktop qui parle...

A VISION IN GREYSCALE

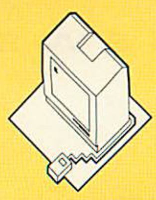
WILD Vision launched a low cost monochrome real-time video digitiser at the Acorn User Spring Show. GreyHawk is a junior version of the popular full-colour Hawk V9.

Like the Hawk V9, GreyHawk is mated to a dedicated version of ScanLight, the image processing application from partner firm Computer Concepts. Genuine 256 grey level palette shading is provided. ScanLight provides plenty of tools to knock grabbed video frames into shape.



256-greyscales from the television

GreyHawk is also compatible with the Colour Card. The only obvious omission appears to be the lack of a S-VHS input to supplement the BNC composite video connector. Show visitors enjoyed an introductory price of £99 including VAT but this has now reverted to the standard price of £99+£6 P&P +VAT. Contact Wild Vision on 091-519 1455.



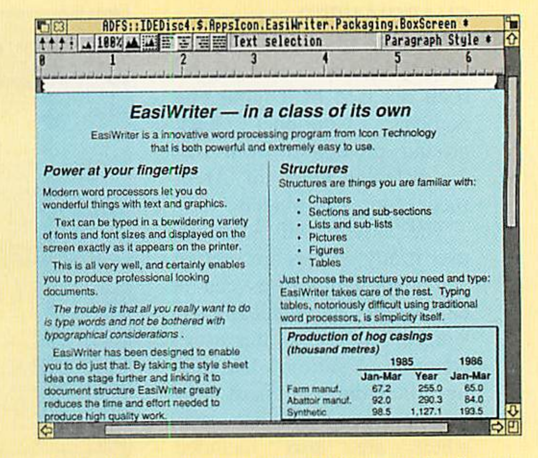
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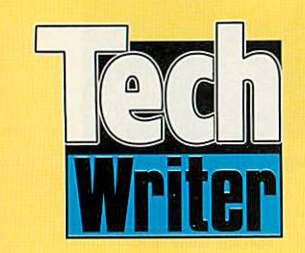


EasiWriter

Modern word processors let you do wonderful things with text and graphics. Text can be typed in a bewildering variety of fonts and font sizes and displayed on screen exactly as it appears on the printer.
This is all very well, and certainly enables you to produce professional looking documents. The trouble is that all you really want to do is type words and not be bothered with fiddly typographical details.
EasiWriter has been designed to let you do just that. You just choose the sort of structure you want - chapter, section, table etc. - then type the words. What could be simpler? Once you've experienced its capabilities you won't settle for less. **Price £149**

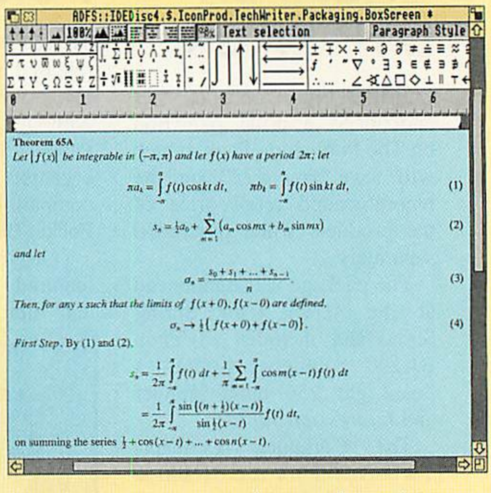


"I would recommend EasiWriter as the best RISC OS word processor."
Archimedes World



TechWriter

Do you ever write documents that contain mathematical equations? If so, then you probably type the words first and add the equations later by hand. And no doubt you often dream of the day when you will be able to type the equations along with the words. Well, now you can stop dreaming because TechWriter has turned the dream into reality. We have taken all the features of EasiWriter and to these we have added a powerful equation editor that automatically applies the rules of mathematical typography on your behalf. All you do is choose the functions and type the symbols. TechWriter does the rest. Use it to produce exam papers, worksheets and technical reports with unrivalled ease. The end results are comparable with the best mathematical typesetters. **Price £199**



"Looked on as a complete package for producing technical and academic documents TechWriter is nothing short of excellent."
Graham Bell, Acorn User



StartWrite

Just for a second, imagine all the plus points of EasiWriter simplified into a new entry-level word processor.
Well, that is precisely what StartWrite is all about. Even the price is scaled down.
There is nothing complex involved, yet StartWrite still outperforms any comparable word processor on the market. As an indication of its potential, it's often impossible to tell whether a document has been created using StartWrite or EasiWriter.
Without doubt, the younger members of your family will find StartWrite an education in itself. What's more, StartWrite represents the perfect stepping stone to EasiWriter and TechWriter. **Price £69**

ADFS::IDEDisc4.$.IconProd.StartWrite.Tutorial.SpellCheck

All About the Phoenix

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Prices exclude VAT. Call for education prices and site licences. EasiWriter, TechWriter and StartWrite are ideal for Archimedes and all A-series with 2MB RAM or more.



NEW CIS PAINTING APPLICATION

QPAINT is a new art package from Cambridge International Software. CIS hopes that *QPaint* will rival painting packages available for the Amiga and the PC.

Though incomplete, the pre-release version of *QPaint* that CIS had at April's *Acorn User* Show contained enough goodies to turn the heads of Amiga *Deluxe Paint* devotees.

The image generation tools feature a wide array of drawing and cutting facilities. Text can be previewed and is anti-aliased when painted.

The magnification tool splits the screen into real size and magnified halves, and the arrow keys can be used for scrolling. The circular and linear fills are excellent, using *Artworks*-style dithering, and conventional dithering is also selectable. With careful use of the blending and smoothing tools you can very quickly create an image that is almost misetakable for a screen-shot from an *Artworks* file.



The latest painting package put into action

CIS is still to fully-implement the smooth, tint, warp, envelope and perspective tools. The animation suite and memory-dependent undo buffers may or may not appear in the first release.

As a fast sprite generator and editor *QPaint* already performs very well. The unfinished product offers much to recommend it above *Paint*. When CIS decides on a price, it will be interesting to see how *QPaint* fits into the established market.

For more details, contact Cambridge International Software, Unit 2a, 436 Essex Road, London N1 3QP, tel: 071-226 3340.

Jack Kreindler

SHARE IT

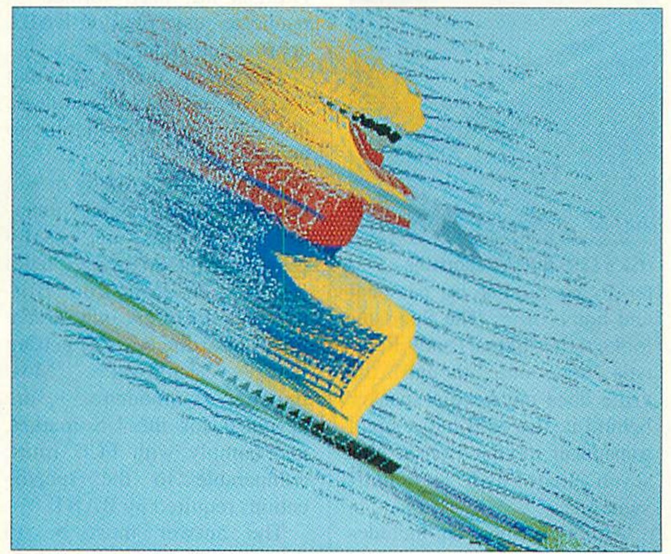
PROCESS is a rather impressive shareware graphics processing package from Denmark. The list of features is impressive and includes the ability to load 256-colour and 256-greyscale sprites, as well as colour separation into either RGB or CMYK.

Most of the painting tools from *Paint* have been incorporated into *Process*, along with a number of processing tools, like histogram stretching and equalising, noise removal and contrast control. Pictures can also have a number of effects applied to them such as rippling, pointillising and twisting.

Process should be available from public domain libraries (see Software Showcase at the back of the magazine) or direct from the author Henrik Bjerregaard Pedersen at Stengaards Alle 13 B, DK-2800 Lyngby, Denmark, tel: (+45) 42883756.

Rob Miller

PIC OF THE MONTH



ARTWORKS is proving to be an extremely popular package and many of the submissions for Pic of the Month are created with it. Eric Bramhill's Skier makes interesting use of the blend tool to achieve a sense of movement in the picture. Eric drew a single skier first, which he then cloned behind the original. He then filled the cloned skier entirely with white (both lines and fills) and blended it with the original skier over ten steps. Further background shading was added in *ArtWorks* and the picture was then grabbed using *Paint* and touched up using *Paint*'s spray can. Send your pictures to The Graphics Page at the usual address.

IN BRIEF

● GRANNY'S GARDEN, the recently released educational package from 4Mation is making the jump to CD-Rom. The extra space will also allow for a number of enhancements including better graphics and sound. If all goes well with *Granny's Garden*, 4Mation hopes to move further into the world of CD-Rom and promises some 'exciting developments' in the near future. Further details can be obtained from 4Mation on (0271) 25353.

● PROARTISAN 2, Clares' successor to its popular 256-colour art package, is coming along in leaps and bounds.The package can now make use of the 15-bit colour modes provided by Computer Concepts' Colour Card, giving access to 32,768 colours. More image processing tools have been included and the front end generally tightened up.

A definite release date has not been set yet although Clares is confident that the program will be shipping at the start of the summer. More information can be obtained from Clares Micro Supplies on (0606) 48511.

● GreyHawk is a new greyscale video digitiser from Wild Vision. The digitiser has been designed to complement Wild Vision's existing range of video add-ons and is fully compatible with Computer Concepts' Colour Card. GreyHawk is yet another example of Wild Vision and Computer Concepts' collaboration and further products are to be released in the future as a direct result. More details on the GreyHawk card can be obtained from Wild Vision, 15 Witney Way, Boldon Business Park, Boldon Colliery, Tyne & Wear, NE35 9PE, tel: 091-519 1455.

● You can contact the Graphics Page with any news, views or comments by writing to Rob Miller, The Graphics Page, BBC Acorn User, 101 Bayham Street, London NW1 0AG, or by modem via Arcade BBS user #1144. Arcade is on 081-654 2212 or 081-655 4412.

If using Arcade, please stick to messages only. Any large files such as pictures should be sent on disc to the address above.

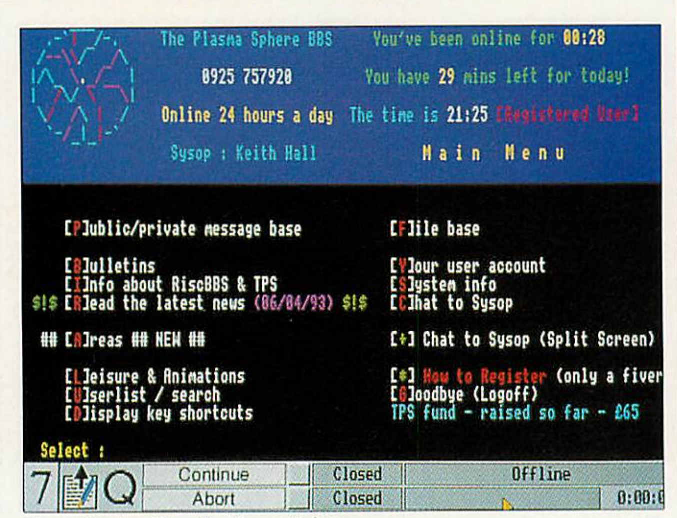


TOUCHING THE PLASMA SPHERE

PLASMA Sphere BBS is one of the few Archimedes systems running in the north-west. Sysop Keith Hall operates from Lymm in Cheshire, using an A410, equipped with an Arm3.

The system runs Carl Declerk's RiscBBS PD bulletin board software, and has around 228Mb of hard disc storage available. Keith is one of several programmers wrestling with the convoluted source code of Binkleyterm. This BBS mailer interface program originated as shareware for PC BBSs.

It is being ported to the Arc, with extensive changes to take advantage of Risc OS. A BBS mailer program enables communication between BBS systems to allow the world-wide exchange of FidoNet messages. Keith has also written several door programs that will add features to RiscBBS.



Planet Earth calling the Plasma Sphere

The Plasma Sphere features over 50 file subject areas, including graphics, sound, games, programming, Econet utilities, a new fractals area, Psion/Pocket Book programs, public key cryptography and Acorn support files.

Plasma Sphere is available on FidoNet as node 2:250/219 and supports all speeds to 16k8 HST or 14,400bps with V42bis.

LOW-COST MODEMS

US ROBOTICS has announced a new range of low-cost V32bis modems.

Each of the Sportster range features 14,400bps data and 9600bps fax class one maximum speeds. Error correction with V42 and MNP levels one to four is included, with V42bis and MNP5 compression. Lower speed capability from V21 (300bps) up, including V23 (1200/75bps Viewdata) is built-in.

Auto-answer and autodialling by pulse or tone, and call progress monitoring are featured, as well as four-number store, call monitor speaker and volume control.

Although the maximum DTE (computer-to-modem) speed of the Sportster is 57,600bps, USR says that only the Courier range will support the forthcoming VFast, 28,800bps standard.

Three variants of the Sportster are available, the external IBM PC version being of most interest to Acorn users. The other two are an internal PC card and a Mac-specific version. USR expects the Sportster to be bought by personal and home users. The Sportster looks rather like a Tandy Realistic intercom, though the grille does not have a speaker behind it: the PCB has a small transducer mounted on it, plus seven Leds and an on/off switch.


USR's £399 budget Sportster

Although Sportster includes PC *Blast Fax* comms software and *WinFax Lite* at £399 inc VAT, the external version is available from The Serial Port, bundled with *Arcterm7*, *ArcFax*, and modem cable for Acorns for £359 inc VAT.

Contact US Robotics on (0753) 811191, and the Serial Port on (0749) 670058.

LINES LAW

A PRESSURE group of 16 modem manufacturers and suppliers led by Dataflex Designs has been formed to eradicate use of non-BABT approved modems.

The group points out that users of unapproved modems on BT lines are liable to prosecution.

It is not illegal to buy or sell them, however, and unapproved modems are usually cheaper, undercutting legal approved products from British manufacturers who have had to bear the costs in getting BABT approval. Most imported modems are designed for the US market, and comply with FCC rules: comparable to the specifications required by BABT.

The answer must be to design approval into the equipment in the first place, and for the BABT fees to be set at a level that will allow UK manufacturers to compete more effectively with imported products.

We have the technology and the expertise – all we need is the incentive and imagination.

NEWS IN BRIEF

● DAVID Pilling is now shipping *ArcFax* 1.06, which has numerous improvements and tweaks, including the long-awaited class one modem driver. Other improvements include block driver support for port expansion cards, embedded destinations in faxes, header lines and an auto-answer server facility where a specified fax document can be sent to all fax callers.

Upgrades are free if you return your original disc with a stamp, or send £23.96 to David Pilling. PO Box 22, Thornton Cleveleys, Blackpool, FY5 1LR.

● OWNERS of the Acorn A4 portable and Pocket Book can find an active user group on The Digital Databank BBS. *Portable Newsletter* is a downloadable *Wordz* format magazine edited by Ned Abell, and contains news, hints, tips and reviews of interest to all Acorn portable users. The current issue includes a simple design for an A4 trackball support, and reviews of the Psion Series 3 and the Acorn A-Link. A demo of *Wordz* is also available from the Digital Databank, on (0707) 329306 (300-14400) and (0707) 323531 (300-2400) both 8N1 scrolling.

● ARCTIC BBS, the other London Archimedes BBS, has now graduated from being a FidoNet point to becoming a full node, and has the number 2:254/86. Arctic BBS is on 081-903 1309 and runs a 16k8 HST USR modem, catering for all scrolling 8N1 speeds and standards.

● ANOTHER BBS that has opened a specialist raytracing file area is DarcWorld IES BBS. Sysop Tom Crossland has uploaded hundreds of scene files, as well as high quality 24-bit raytraced images. There are several raytracer packages for both Risc OS machines and PCs, as well as source code for raytracing programs. DarcWorld promises one of the most comprehensive raytracing areas on any UK BBS. Call DarcWorld on (08675) 77724 300-14400 8N1.

● YOU can contact me with any ideas by writing to: David Dade, *BBC Acorn User*, 101 Bayham Street, London NW1 0AG or by modem on Arcade BBS, User #2 – 081-654 2212 or 081-655 4412.

How to Digitise a Video Picture Quickly on your Archimedes

Method A

- Contact your local Acorn Dealer to find out whether they offer a video digitiser for your Archimedes - don't hold your breath if you own an A3010, A3020 or A4000!
- Have your digitiser fitted.
- No lead is supplied? Attempt to identify connector and then go out and purchase the relevant lead. (Don't forget your wallet!)
- Run the relevant application.
- Make sure digitiser is real time and does not require a freeze frame video.
- Locate and change Contrast, Brightness, Red, Green and Blue controls to be able to view first image.
- Rewind the tape to preview. (if the image you wanted wasn't live and is retrievable!)
- Digitise required image.
- Image too dark? Change the Contrast, Brightness, Red, Green and Blue controls to roughly what you think will produce the right effect.
- Rewind the tape. Find the right spot and select the image again!
- Estimated alteration to the image controls not quite right? Change the Contrast, Brightness, Red, Green and Blue controls to roughly what you think will produce the right effect.
- Rewind the tape. Find the right spot and select the image again!
- Looks just about right, so save anyway!
- Load the sprite into another package for dithering.
- Save final image.

Method B

- Contact your local Acorn dealer to have a £79.00 Vision digitiser fitted to any Archimedes (exc. A4)
- Connect to your video source with the lead supplied.
- Run the Vision application and select any picture from any moving video.
- Image too dark? Use on screen controls to change Contrast, Brightness and Colour while processing.
- Save the fully dithered, High resolution 254 x 720 sprite.
- Use your sprite in any DTP document to impress your friends.
- Bank the money you have saved!



A3010 £35.00 inc VAT 1Mb RAM Upgrade	A3020 £59.00 exc VAT 2Mb RAM Upgrade
A3010 £149.00 inc VAT 4Mb RAM Upgrade	A4000 £59.00 exc VAT 2Mb RAM Upgrade



A3000	
Hard Disc Drives	
100Mb External	£479.00
200Mb External	£699.00
HardCard100	£429.00
20Mb IDE Internal with User Port	£179.00
60Mb IDE Internal with User Port	£269.00
Memory Upgrades	
1Mb RAM	£49.00
4Mb RAM	£129.00
Expansion	
Econet	£39.00
Serial Upgrade	£17.50
User/Analogue Card	£39.00
Podule Case	£15.00
Video Digitisers	
Mono Vision Internal	£49.00
Colour Vision Internal	£79.00
Colour HiVision Internal	£129.00
Mono Vision External	£62.00
Colour Vision External	£92.00
Colour HiVision External	£142.00
Ultimate Expansion System	
MultiPodule (3 slot)	£38.00
MultiPodule+20Mb+PSU	£229.00
MultiPodule+60Mb+PSU	£309.00
A5000/400/300	
Hard Disc Drives	
100Mb Internal SCSI	£399.00
200Mb Internal SCSI	£649.00
20Mb Internal IDE	£179.00
60Mb Internal IDE	£269.00
Memory Upgrades	
1Mb RAM for A400	£45.00
2Mb RAM for A5000	£89.00
Expansion	
Econet	£39.00
Video Digitisers	
Mono Vision	£49.00
Colour Vision	£79.00
Colour HiVision	£129.00
Ultimate Expansion System	
MultiPodule (2 slot)	£39.00
A3010	
Hard Drives	
20Mb IDE	£186.38
60Mb IDE	£271.49
Memory Upgrade	
1Mb RAM	£29.79
4Mb RAM	£126.81
Ultimate Expansion System	
MultiPodule (IDE + 2 slot)	£41.70
MultiPodule+20Mb+PSU	£220.43
MultiPodule+60Mb+PSU	£297.02
A3020/4000	
Memory Upgrade	
2Mb RAM	£59.00
Expansion	
Econet	£39.00
Ultimate Expansion System	
MultiPodule with User Port (3 slot)	£38.00
PSU+Fan+Buffer Kit	£30.00
MicroPodules for Ultimate	
Laser Express	£249.00
Colour Vision	£79.00
Colour HiVision	£129.00
SCSI, with CDFS	£69.00
Analogue	£29.00
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Serial	£49.00
MIDI	£49.00
Scanner (Hand)	TBA

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Fax: (091) 4910431

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INTERACTIVE VIDEO FOR SCHOOLS

CUMANA has launched interactive video (IV) systems, for both hardware and software. The NCET has accepted these under the Department for Education's recently-introduced pilot scheme.

Known as the Level One and Level Three Systems, the new kits meet the specifications laid down by the NCET for running the National Curriculum's *World of Number* disc.

Cumana's Level One IV system comprises a Pioneer CLD-V2300D PAL/NTSC video disc player, a Pioneer barcode reader and a Philips colour monitor.

The system costs £999 to educational bodies and Cumana has been appointed as a main distributor for *World of Number* (Key Stage One and Two) primary school mathematics materials and IV discs. These require no keyboard or computer skills.



Filming the National Curriculum Council's interactive video

Cumana also supplies an IV/CD-Rom system based on an Acorn A5000 computer. This system can run *World of Number* Key Stage Three and Four materials both on CD-Rom and interactive videos.

This workstation appears to offer the best value, since it gives access to both the increasing number of IV discs available and to all the CD-Rom software as well.

It is hoped future government funding allows purchase of Acorn-based systems rather than just PC-based IV systems.

Further information can be obtained from Cumana on (0483) 503121.

POSTER WINNERS

MANY thanks to all the schools who entered our *Acorn User* Spring Show competition. Schools in the local area were asked to design a poster for the Harrogate show and the winners were from Oatland Junior School and The Joseph Rowntree School.



Many thanks to all who took part, including, shown above, pupils from Moorside Junior School

NETWORK MANAGER

FOR those managing networks, either Econet or Ethernet, level one or level three, there are a variety of new pieces of management and performance software.

Netmanage, first seen at Bett in January, is now being marketed by Suitable Software, tel: (0638) 720171. This allows easy management of school-based networks. Users can be easily set up in groups with common characteristics, and directory structures can be set and allocated.

Priced at £50 I would recommend that all network managers investigate further.

Digital Services has released a new product specifically designed to provide Acorn AUN level four Ethernet networks with more speed.

Netgain for Ethernet, follows its previously successful *Netgain for Econet* and Digital Services claims the concentration on removing bottlenecks and improving caching technology has resulted in staggering speed improvements.

This system takes no memory on the workstations and trials have shown it loading software such as *Artworks* in six seconds compared with 87 seconds on standard level four AUN Ethernet.

The price is £200 for the server pack and the first ten stations, with additional ten-station packs at £100. For more details contact Digital Services, tel: (0705) 210600.

Angelsoft Education is marketing a piece of software called *AppFs*, designed to serve applications round any network at increased speeds.

Written by people who have been involved in the use of educational networks for a number of years, this greatly increases the viability of serving applications via a network.

Further information from Angelsoft, 35 Heol Nant, Swiss Valley, Llanelli SA14 8EN.

IN BRIEF

● Widgit software has come up with a new idea for software training.

It has launched three training videos to accompany its popular primary and special needs software packages – *Choices*, *Screenplay* and *GridIT*.

Each video provides helpful instructions on how to load the software; using the program; using the existing resources and making new customised resources, as well as suggesting curriculum ideas.

The videos should enable teachers working on their own in schools, or groups of teachers undertaking In Service Education Courses to learn how to use these pieces of software.

Choices is a framework program designed to encourage children to explore decision-making and selection processes,

Screenplay is a versatile program that enables children and teachers to create exciting animated stories incorporating pictures, text and sound.

GridIT helps children develop spatial awareness, number skills and logical thinking.

Each video lasts approximately one to one and a half hours and can either be hired for five working days or bought outright. This is a great idea. Perhaps other software houses could take note.

Further information on both the software and the videos can be obtained from Mike Detheridge, at Widgit Software on (0926) 885303.

● *Startwrite* has been upgraded to include a speech option. In order to take advantage of this facility you must have a copy of either Superior Software's *Speech* or PEP's *Speech* software.

Vouchers for either option at reduced prices will be given when purchasing *Startwrite*.

Priced at £55 to education users, and given the possible inclusion of numerous language dictionaries, this seems a good piece of software to investigate, especially for teachers working with pupils who have specific learning difficulties.

If you want further information, contact Icon Technology on (0533) 546225.

EDUCATION WAS NEVER THIS MUCH FUN

Noddy's Playtime is a graded creativity and entertainment package for home computers based on solid educational principles for 3-7 year olds.

Drive with Noddy in his car and explore the magic of Toytown, visiting the 8 special learning locations.

- Railway Station - memory game
- N&B Works - observation game
- Chimney House - musical fun
- Noahs Ark - jigsaw puzzle
- Farm Yard - animal matching
- Market Place - letter recognition
- Post Office - counting
- Police Station - maze game

Also included is a junior Art Package which develops your childs creative ability.

- Picture Colouring.
- Electronic 'fuzzy felts'.
- Freehand drawing with pens and spraycans.
- 50 pre defined fill patterns.
- One finger on, one finger off mouse control for tiny hands.

Noddy's Playtime features user friendly icons so that even the youngest family member can learn and have fun.

There is a choice of 3 carefully defined learning levels designed in consultation with teachers. Noddy's Playtime also includes FREE: Toytown map, keyboard overlay and wobbler. A comprehensive manual and parent teacher guide will enable you to bring your childs imagination to life.

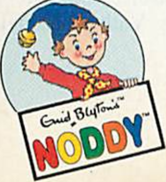
RISC OS 2 + 3 compatible



THE JUMPING BEAN CO.

Leen Gate Lenton Nottingham NG7 2LX
Tel 0602 792838 Fax 0602 780963





IBM PC screen shots



SHORT REVIEWS

This month we take a quick look at some of the latest products around – from a guide to printing, to a new hypermedia package.

A GUIDE TO PRINTING IN RISC OS 3

Supplier: Hampshire Microtechnology Centre
Tel: (0705) 378266
Price: £6 per copy, £50 for ten copies, £25 for photocopy master

Let's face it, technospeak rather than English is the first language of computer manual authors. In fact, Acorn's writers are better than many, but any help with translation is welcome, which is where these two A4 booklets come in.

The first covers Risc Os 3 but if you've bought an Archimedes in the last 18 months or so it provides a handy introduction to your machine.

I upgraded to Risc OS 3 a few months ago and discovered a number of facts about the operating system which I hadn't realised before. The second deals with printing, an activity which never ceases to cause headaches.

Clearly presented in pretty plain English, if you find printed materials reassuring, then I can certainly recommend these accessible and inexpensive guides.

NAVIGATOR

Supplier: Topologika
Tel: (0733) 244682
Price: £40 + VAT

Navigator is a navigation systems tutor. In other words it teaches the user how to move around maps using a variety of methods, including latitude and longitude, ordinance survey references, compass points, orienteering bearings and vectors.

One of the main strengths of this program is that it can be used across the age and ability ranges. For example, the Tiny Turtle option gives a limited, preset choice of instructions for moving the pointer or dart, but children can then progress to Turtle, which allows them to input their own directions. Features can also be disabled via a Preferences menu.

Maps can be *Draw*, *Paint* or compressed *Imagine* files and a small selection is provided with the package – I found a school, a treasure island and the Orkneys on the disc.

Creating your own is obviously fairly time-consuming but worth it if you want to study a particular area in depth. You can design your own darts, too, although the ready-made collection contains plenty of shapes, figures, cars, boats and planes.

The Calibrate menu means you can adjust the scale of movement on a map and it's also possible to add a link-point, so when students reach a specific location a message is triggered or another map is loaded. This can give the illusion of zooming in on a region.

Students can play around with *Navigator*, finding out for themselves how the different systems work, or they can learn through investigations set by the teacher. Either way, this is a simple idea which has been effectively executed to produce a neat program.

Optima: produces hypermedia books that are good enough to eat

OPTIMA

Supplier: Northwest Semerc
Tel: 061-627 4469
Price: £18 + VAT

Optima is a hypermedia program which allows text and graphics to be positioned on the screen to produce pages which build up into books.

More excitingly, sound can also be integrated, so, for example, a picture of a pig can be made to squeal or the computer can be set up to read dialogue aloud.

The handbook is small and spiral-bound, so flicking through it is straightforward, and it's easy enough to get going with the package. A few sample *Draw*, sprite and sound files are included, and of course you can import them from other sources or, even better, create your own. The only feature I found odd is that once a graphic or text is selected, it automatically follows the cursor around, whereas my instinct is to drag it. This meant that at first I kept inadvertently spoiling my page but, hey, I'm adaptable, and I soon got the hang of it.

Its presentation suggests that *Optima* is aimed at young children and, given Northwest Semerc's area of expertise, special needs users, but older students or adults using sophisticated raw materials could produce sophisticated results.

This is a nice package and teachers and pupils will find many uses for it in the classroom. However, while I enjoyed using it, I have to say it didn't quite wow me, but perhaps I've just become too blasé about this type of software.

Alice Smith

TRAINING FILE

For those interested in improving their skills, Acorn is running its training conference, Access IT, during the summer term.

Sessions range from network management and use to curriculum-based sessions and beginners. Many educational software houses will exhibit, as well as running training sessions on their own software.

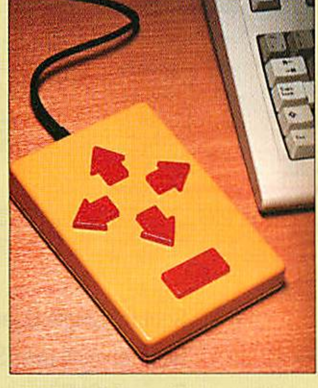
The conference at Nottingham University takes place on 9 and 10 July. The price, including full board and conference fee is £425. Booking early gains a reduced price of £169 + VAT. Contact Acorn on (0223) 254254.

EARLY LEARNING JOYPAD

New for early learners from Holdfast is the Joypad. Specially designed for younger children who find keyboards, mice and joysticks too tricky, it is friendly and tough and will sit happily on the carpet.

It is attractively designed in red and yellow and the chunky round shape will suit all surfaces. It is possibly suitable for special needs use as well. From simple one-button activities through to full mouse emulation, the joypad promises to be a robust alternative to the mouse.

It plugs directly into the joystick port on the A3010, and use of the Leading Edge joystick interface for other Arcs is recommended. Priced at £24.99, it is available now. If you are interested, further information can be obtained from Holdfast on (0454) 411126.

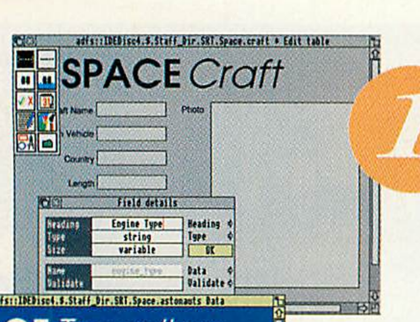


Clare Johnson

it's this easy with



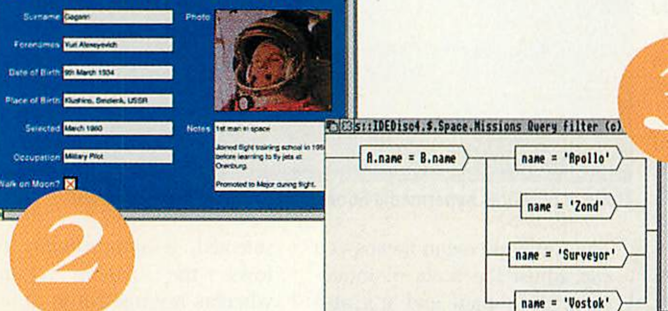
Squirrel



Create Mode

1

Build new databases with just a few mouse operations. Never before has table creation been this quick and easy. Squirrel is a no limit product! There are no limits to the number of characters in a field, fields in a record, or records in a table. Both single and multi line text fields are supported. File definitions may be changed at any time.



Query Mode

3

Squirrel incorporates a radical new graphical approach to creating complex queries – a series of INCLUDE and EXCLUDE filters are linked to form a graphical flowchart. Squirrel is fully relational, allowing data from multiple databases to be joined in one query or report.

A.name = B.name

name = 'Apollo'

name = 'Zond'

name = 'Surveyor'

name = 'Vostok'

2

Data Mode

Store images, text and sounds within each record to create powerful multi media databases. Browse through the database in any field order.



Query Data Mode

4

Browse through results of queries on screen Query definition may be saved, or query data may be re-indexed as a new table.

Reporting

5

Include Sprites and Drawfiles in reports to produce desk-top publishing quality output Powerful label printing allows multiple labels across the web.

SPACE *Flight*

Apollo Project Mission Log

Mission Number	Launch Date	Crew Members	Duration (hh:mm:ss)	Objective of Mission
Apollo 7	11 October 1968	Schirra Eisele Cunningham	260:09:03	Earth orbital manned test
Apollo 8	21 December 1968	Borman Lovell Anders	147:00:42	Moon orbital test
Apollo 9	3 March 1969	McDivitt Scott Schweickart	241:00:54	Docking test
Apollo 10	18 May 1969	Stafford Cernan Young	192:03:23	Lunar Module flight test
Apollo 11	16 July 1969	Armstrong Aldrin Collins	195:18:35	Manned lunar landing
Apollo 12	14 August 1969	Conrad Gordon Bean	244:36:25	Manned lunar landing
Apollo 13	11 April 1969	Lovell Swigert Haise	142:54:41	Manned lunar landing (Aborted)
Apollo 14	31 January 1971	Shepard Roosa Mitchell	216:01:57	Manned lunar landing
Apollo 15	26 July 1971	Scott Irwin Worden	295:11:53	Manned lunar landing deployment of Lunar Roving Vehicle
Apollo 16	16 April 1972	Young Mattingly Duke	265:51:05	Manned lunar landing deployment of Lunar Roving Vehicle
Apollo 17	7 December 1972	Cernan Evans Schmitt	301:51:59	Manned lunar landing deployment of Lunar Roving Vehicle

Officer Commanding
Vandenberg Air Force Base
Santa Maria
California
USA

The Director
Kennedy Space Centre
Cape Canaveral
Florida
USA

The Director
Wallops Island Space Centre
Bogues Bay
Virginia
USA

Officer Commanding
Edwards Air Force Base
California
USA

The Director
Baikonur Space Centre
Leninsk
Tyuratam
Russia

The Director
Northern Space Centre
Plesetsk
Archangel
Russia

The Director
San Marco Equatorial Range
Formosa Bay
Kenya

The Director
Guiana Space Centre
Kourou
French Guiana

Dan Dare
Pilot of the Future
Croydon
Surrey
UK

The Director
National Aeronautics and Space Administration
Washington DC
USA

José Jiménez
Mexican Space Project
Teajana
Mexico

The Director
European Space Agency
1442 Haganbast
Roma
Italy

What the press say...

"It has leap-frogged all the database development of the past 10 years and emerges as the pre-eminent data storage system for the Arc."

Steve Turnbull, Micro User

"The ease of table creation, data entry and browsing, searching and sorting place this innovative software in the first league."
"No other product approaches the performance of Squirrel at anything like the price and it is to be highly recommended."

John Schild, RISC User

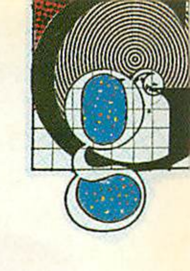
"Probably the ARC DBMS most in touch with current trends in database development."
"You are going to need Squirrel which is easily the most powerful database available today."

Archimedes World

Squirrel Single User	£ 129.00 + VAT
Squirrel multi user/Site Licence	£ 516.00 + VAT
Squirrel 'C' Developer's Toolkit	£ 99.00 + VAT



9 Wayte Street, Cosham, Portsmouth
Hampshire PO6 3BS Tel 0705 210600





Graphics is one of the Archimedes' strengths, but which product do you choose? Rob Miller shows what can be achieved with the leading packages

GET IN THE **PICTURE**

One of the strongest features of the Archimedes and of Acorn's other 32-bit computers is their graphics. The fact that it's possible to create colourful, high-resolution pictures has led to a plethora of software packages being released over the years.

The choice of art packages is vast and the task of comparing one against another extremely difficult. This article therefore sets out to show what's possible with the leading programs at present. I'll also attempt to show what can be done with just the software supplied with the Archimedes (*Paint* and *Draw*).

Choosing an art package from scratch is hard, so it's important to establish exactly what you want, with a few basic guidelines. Like any other software purchase, you should make a list of the things you require the software to do – it's no good just going by the way the program looks on screen, or on the fact that you like the supplier. You should also know roughly how much you can spend on the package.

The first thing to decide is what sort of graphics program you need. There are two distinct types; pixel-based (or bitmap) and object-based (or vector). *Paint* and *Draw* (supplied on Applications Disc 1 with Risc OS 2 and in Rom with Risc OS 3) are bitmap and vector graphics programs respectively. *Vector* (covered later in this article) is a vector graphics program.

If you already have an Archimedes, you will almost certainly have used *Paint* and *Draw* and should realise the difference between the two. *Paint*, being a bitmap graphics program allows you to create pictures from single dots (or pixels). These are arranged in a grid format and a block of them is referred to as a sprite.

Draw is a vector graphics program and uses lines and curves (defined by their co-ordinates) to construct pictures. If you want a vector graphics program, there are really only two choices available: *ArtWorks* from Computer Concepts and *Vector* from 4Mation. Both are included in this round-up and are covered in detail later on.

If, on the other hand, you want to produce bitmap graphics, the list of possible programs is seemingly endless. Looking closer at the features provided by each program should make decisions easier.

Virtually all bitmap graphics programs offer a basic set of tools such as points, lines, triangles and circles. Editing via a magnified version of your image is also common, as is cutting out and moving areas of a picture. Different programs approach a task in different ways; how they do so may affect your choice.

Having had experience of nearly all the art packages that have come out for the Archimedes, I've formed my own list of ideal features for the perfect program. No one package contains the lot, although a few come close.

Being able to draw individual pixels is an important facility and is essential for editing work and adding fine detail to a picture. This may sound an obvious feature to include, but, surprisingly, is missing from some art packages. The facility for drawing continuous, freehand lines (often referred to as doodling) is also important and allows natural-looking results. By natural I mean similar to drawing with traditional crayons or painting materials.

Other tools to look out for in a good art package are graduated fills (useful for giving a solid look to objects); any-shape cut-outs (for extracting and moving irregularly shaped areas of a picture); and some form of grid-locking (for accurate placement of lines and shapes). In addition, most software producers include unique features to make their program stand out from the rest.



BEST VECTOR GRAPHICS

ARTWORKS

Supplier: Computer Concepts
Tel: (0442) 63933
Price: £169 + VAT

Being a vector graphics program, *ArtWorks* is often assumed to be only suitable for pictures that have a certain 'artificial' look to them. Using the rain forests as a theme, it's quite easy to see that this is not the case.

I took the example of a tree frog. This was ideal because of its combination of bright and vivid colours, something *ArtWorks'* clever dithering technique handled extremely well, as you will see from the illustration on the right.

The subtle blend of one colour into another makes *Artworks* ideal for reproducing the effect of light and dark on the body of the brightly coloured tree frog.



ArtWorks dithering technique allows vivid colours to be blended smoothly

The first step in the picture was to draw in a rough outline for the various parts: the reed and the frog itself. Being a simple shape, the reed was easy to construct from a few straight lines. The frog, on the other hand, required a large number of curves to get the correct shape. *ArtWorks'* freehand draw tool was extremely useful here.

Next, the various shapes were filled in with 'flat' colours; that is, without using any graded fills or blending. Because ArtWorks uses a 24-bit palette, it's possible to select practically any colour you need, so it was easy to get the range of greens, reds and yellows required.

Finally, the flat areas were shaded to give the frog a sense of depth. *ArtWorks* contains two tools for this, Blends and Graduated Fills, both of which are used in the picture.

The frog's left eye (as you look at the picture) makes use of a graduated fill to give it a spherical appearance. The frog's limbs all make use of blends for highlights and/or for shading.

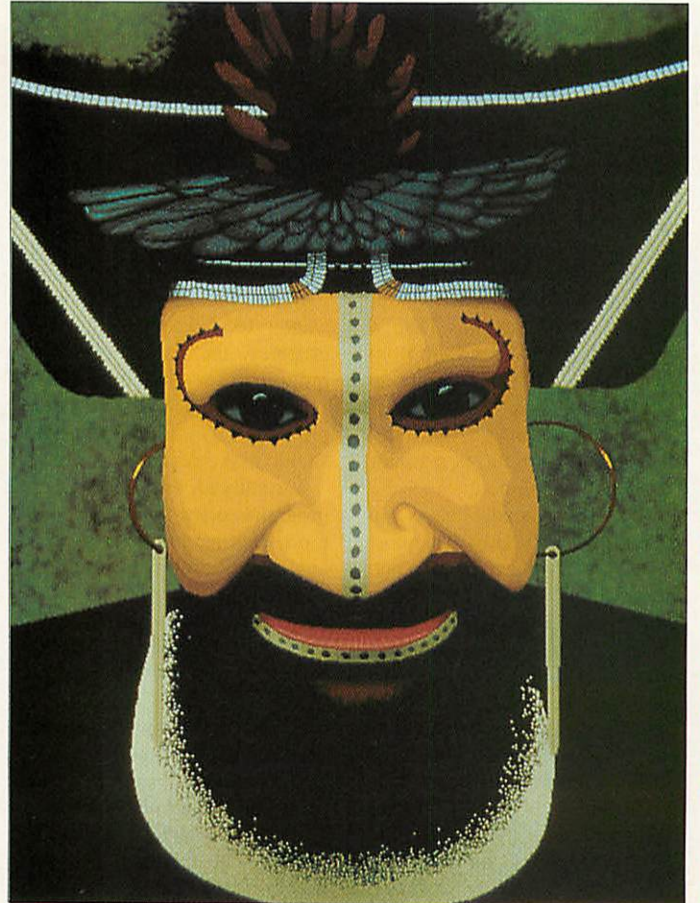
BEST BITMAP GRAPHICS

REVELATION IMAGEPRO

Supplier: Longman Logotron
Tel: (0223) 425558
Price: £139 + VAT

Although human portraits are perhaps one of the most common types of painting, they are quite often one of the hardest pictures to draw. The human form, especially the face, is seen everywhere: in newspapers and on television. Because of the familiarity of the image, it is essential that you get the proportions correct on a portrait if it's going to look any good.

The head was drawn first as a kind of flattened egg. The top and bottom parts didn't need to be too accurate as they were both going to be obscured in the finished picture by the hat and beard. The eyes, mouth and nose were then added as outlines. A good point of reference here was a mirror. The various markings on the face were then added and the whole of the face filled in with approximate colours.


Revelation ImagePro's spraycan tool creates the dappled effect on the beard

The main shading on the face was then applied by drawing in the 'contour' lines by hand and then filling each successive 'height' with a different shade of yellow. Finer shading was then achieved using *Revelation ImagePro*'s Wash tool, with black for darker areas and white for the lighter ones.

Next, the chin was filled in roughly with a dark brown; the beard was then added to the image in black, with the spray can tool.

The grey dappling effect was accomplished by using a white wash, sprayed onto the black background. The hat, plus the feathers were then added, with the feathers being drawn by hand to get them looking correct.

Finally, the background was added by creating a separate picture of random greens. This was then used as a motif for flood filling.

PAINT & DRAW

Free with all Acorn Risc OS machines

Rather than use every feature of *Paint* and *Draw*, I decided to produce a simple but effective picture; making use of what I consider to be the most useful tools in each program.

The first thing to do was create a Mode 28 screen in *Paint*. I then used the Zoom tool to scale it down on-screen, so I could get the proportions correct. This is extremely difficult if you are having to scroll a window around. Detail at this point was unimportant so reduced scale didn't matter.

The branches were drawn using a combination of the Line and Pencil tools. The parrots were added as rough outlines with Pencil, and filled in with the Paint Can tool.

The next step was to scale the picture up (using Zoom) and add detail. The ability to have multiple views in *Paint* made it simple to work on a magnified version while seeing what it would look like at 100% scale. Finally, the background (everything other than the silhouette) was made transparent by filling it in using 'mask' as the colour.

Draw was used to create the background. The sky is two rectangles, one orange one yellow, graded together. *Draw* automatically chooses the graded colours for a smooth appearance. The sun is two circles, one on top of the other, graded from white to yellow.

Lastly, the two images were combined in *Draw* and the finished picture grabbed from the screen using *Paint*. Because Mode 28 had been used, the picture had to be cut out in several parts and re-assembled in *Paint*.



Paint and Draw let you construct striking images with a few, simple elements

PROARTISAN 2

Supplier: Clares
Tel: (0223) 425558
Price: Not yet announced

When magnified, small wildlife such as insects and caterpillars are transformed from mere grubs into beautiful objects. Using a number of techniques, it's possible to reproduce the sharp look of a wildlife photograph.

I started with black background for maximum contrast with the bright colours of the subject. The plant stalk was drawn in in a single green, to ease scaling and positioning of the caterpillar. A rough outline of the caterpillar was added.

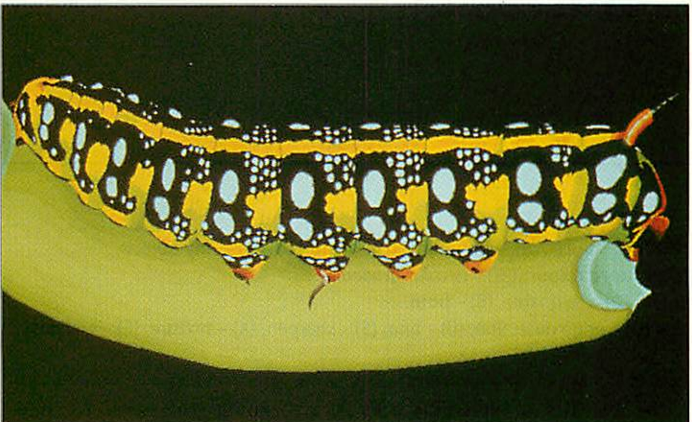
The caterpillar is made up of ten segments, so these were marked out next. Each segment is quite similar, so it was possible to draw the markings on one, and then copy them to the others. In some cases, the duplicate markings were either scaled, rotated or both, in order to make them fit.

The colouring of the caterpillar took the longest amount of time as each white marking was anti-aliased (given a smooth edge) against the dark grey skin.

I contemplated doing the same with the coloured areas, but this lost sharp contrast with the background, so I decided against it.

Most shading was applied by hand, although *ProArtisan 2*'s Opacity tool, which allows a preset amount of colour to be mixed with what is already on screen, was useful to fill in larger areas.

Extra shades were produced for the plant stem by designing a dither pattern of the two lightest greens.



ProArtisan 2 allows you to reproduce the sharp look of a wildlife photograph

VECTOR

Supplier: 4Mation
Tel: (0271) 25353
Price: £85 + VAT

The plant kingdom, like most of nature, displays an amazing semblance of symmetry, not least in the orchids found in tropical rain forests. Quite often, the patterns on orchids are so bright and sharp that one would imagine they had been painted in. Although *Vector* leans more towards being a technical art package, it's quite able to handle such a picture.

Because the picture was too symmetrical, I started off by drawing in a temporary vertical axis, around which the various parts of the picture could be copied and flipped.

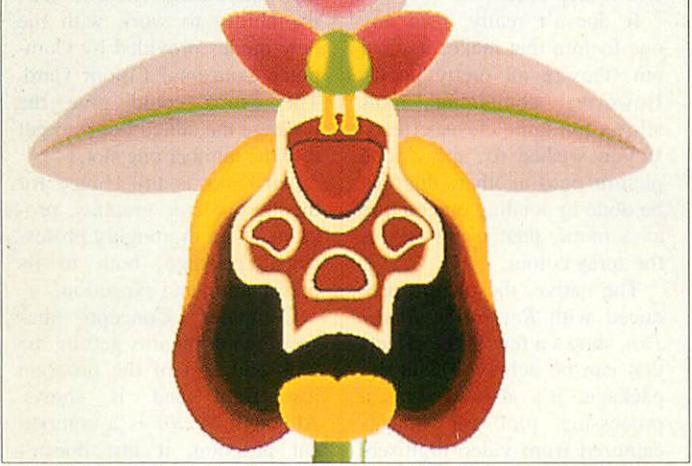
The outlines of the various petals and patterns were then added and copied if required.

Some parts, such as the top petal, were produced as two objects (one a mirror reflection of the other) which were then broken up into lines. They were then recombined as one shape. This technique made it easy to create the symmetry in the picture.

Next, each part of the flower was filled in with the colour most prominent in that bit. Because Vector uses 24-bit colour (in other words 16,777,216 colours) it was possible to select the exact shade required for each piece.

Although the Archimedes cannot display full 24-bit colour as standard, Risc OS 3 does a competent job of displaying extra colours as dithered patterns.

Shading on the flower was achieved by means of *Vector*'s Interpolate tool, which allows one object to be morphed into another. The shape and colour of an object are both altered, making it easy to produce highlights and shadows.



Vector's Interpolate tool lets you alter shapes and colours using morphing

FEATURES LIST

Packages	Individual dots	Lines/Shapes	Circles/Ellipses	Text	Cut & Paste	Fills	Gridlock	Scale/Rotate
Paint & Draw	✓	✓	✓	✓	R	F	✓	✓
Rev ImagePro	✓	✓	✓	✓	R,A	F,G,CG		✓
ProArtisan 2	✓	✓	✓	✓	R,A,D	F,G,CG		✓
ArtWorks		✓	✓	✓	O	F,G,CG	✓	✓
Vector		✓	✓	✓	O	F	✓	✓

Packages	Patterns	Special effects	Zoom/Multiple View	Undo
Paint & Draw			✓	✓
Rev ImagePro	B	T,D,B,S	✓	✓
ProArtisan 2	B	T,D,B,S,X,E	✓	✓
ArtWorks			✓	✓
Vector			✓	

NOTES

1 Types of cut & paste shown are (R) – rectangular, (A) – any shape, (D) – distorted, (O) – Any object
2 Fills shown are (F) – flat colour, (G) – graded colour (CG) – circular graded.
3 Patterns shown are (PD) – pre-defined, (D) – definable, (B) – both.
4 Special effects shown are (T) – trace, (D) – edge detection, (B) – blur, (S) – sharpen, (X) – texture, (E) – emboss.

The best way to show what you can do with each package is by means of illustration. When you thinks of computer graphics, you're more likely to imagine hard edges and rather artificial-looking pictures.

Nature, though, provides ideal material for showing what can be accomplished. Images of rain forests, and the flora and fauna within, was the topic we chose to test out our packages. The range of colours and textures present in such an environment are perfect for stretching any program right to its limits.

CONCLUSION

After exhaustive use of the above programs, I've decided to make not one but two choices as to my favourites.

Out of the bitmap art packages, *Revelation ImagePro* came out on top. Although at first it looks a simple program (the toolbox is particularly uncluttered) the way in which you can combine the different tools and effects puts it above the rest. It's an incredibly easy package to use and no specialist knowledge of graphic technique or theory is required. If there's something you're unsure of, just have a go. Then, if you're unhappy with the result, use the Undo tool to step back.

It doesn't really have any one feature that makes it stand out (they're all pretty good). However, combining tools allows for some clever effects. If you wished to 'spray' one picture onto another, this can be done by loading one picture as a motif, then using this as the spray colour.

The native, the picture produced with *Revelation Image Pro*, shows a few of the effects that can be achieved with the package. It's also ideal as a processing tool for images captured from video digitisers and scanners.

Revelation Image Pro is by no means the cheapest of the art programs on the Archimedes, but then you get what you pay for. In this case you are going to have to pay around £139, and it's money well-spent.

However, buyers should bear in mind that the copy of *ProArtisan 2* used for this review was unfinished. Additional features are planned for the final release. These include the ability to work with the new modes provided by Computer Concepts' Colour Card. The extras could give the package the added boost to get it to the number one slot.

ArtWorks is my choice for the best vector graphics program. It's a thoroughly professional package, both in its presentation and execution.

Computer Concepts has spent many months getting the look and feel of the program just right and it shows. Although *Vector* is a competent program, it just doesn't have the same smooth feel as *ArtWorks*.

If you want to produce precise and complex pictures with a view to having them printed professionally, *ArtWorks* will fit the bill. A word of warning though: it's not a program for the impatient among you.

The picture of the tree frog which we have used took four days of almost continuous work and was still unfinished. Given time though, the results can be outstanding and really professional artwork can be produced.

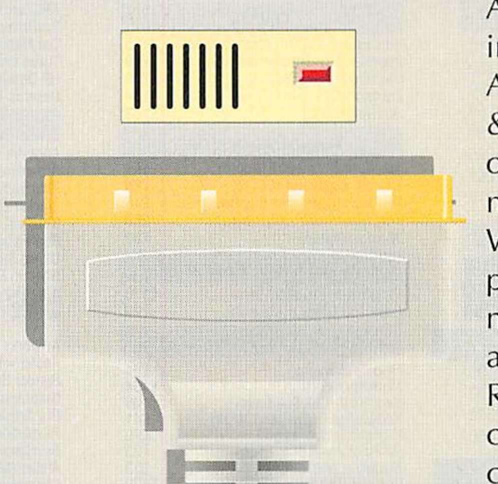
Feature-wise, *ArtWorks* contains virtually all the tools you could require, from distortion and perspective envelopes to graded fills and blends. Another plus point is that *ArtWorks* has been written in a way so that extra tools can be added at a later date without having to completely upgrade the whole package.

Again, *ArtWorks* might cost a little more than most people would expect to pay, but, like *Revelation ImagePro*, you get exactly what you pay for.

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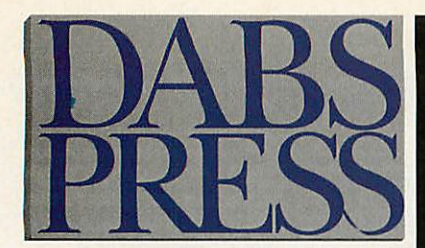
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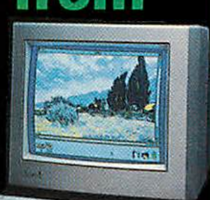
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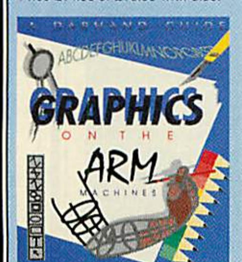
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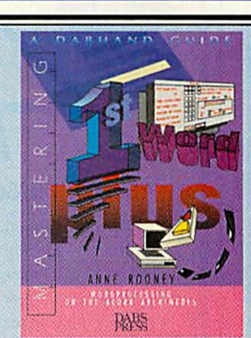
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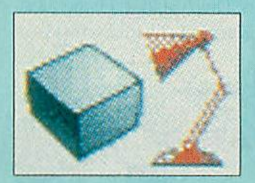
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Rates listed are valid until 31/6/93. The 3.5in disc is compatible with all Risc OS machines. The 5.25in disc contains all eight-bit programs. Subscription rates are listed opposite.

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AUP693

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Month................................**Year** ❑ 1992 ❑ 1993

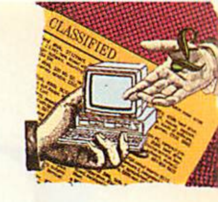
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● Archimedes A310, colour monitor, second 5.25in floppy drive, miscellaneous software – £400 ono. Contact Dr I Kirk, Oxford. Tel: (0865) 779369 eve/weekends

● Wanted Archimedes with colour monitor, will collect. Contact B Young, Berks. Tel: (0836) 556665

● BBC B, colour monitor, recorder, twin drives, Watford Rom/Ram board (full), replay, Teletext, manuals, books, games, excellent condition, boxed – £325. Contact Mr I Twisleton, Northampton. Tel: (0604) 845257

● Acorn multisync monitor, excellent condition, still within warranty, suitable for A3010, A3020, A4000, A5000 or PC computer/Watford PC card – £175. Contact Dr M Anwar, Glasgow. Tel: 041-639 8228 eve, 041-248 2322 day

● 40/80 5.25in Watford Electronics disc drive with power supply unit and Watford Electronics external drive interface for A3000, offers invited. Contact Mr G Scott, Chester. Tel: (0244) 342806

● Master 128, excellent condition, View, Viewspell, Viewsheet, ADFS, BBC Basic, editor, Spellcheck II, Discmaster, manuals and reference manuals, printer driver generator – £160. Contact P Barnes, Wetherby. Tel: (0937) 844318

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● 64K BBC B, Z80 processor, 16k sideways rom/Ram, disc drive, TV, mouse, joystick, Amxart, View, Viewsheet, Wordwise Plus, Cad, games, Elite, exile etc, all manuals, excellent condition. Contact Mr D Watson, Glasgow. Tel: 041-776 3955

● Instant mini Office II, Rom board for BBC B, B+, Master and Compact with instruction manuals – £10. Contact Mrs J Allen, Berks. Tel: (0344) 422614

● The best supply and information and excellent eight-bit PD software, send SAE to eight-bit Software, 1 Oakwood Drive, Heaton, Bolton BL1 5EE.

● Archimedes standard 14in colour monitor, excellent condition – £75, Pace Linnet V21/23 modem new – £30, Risc User magazines, volumes 1-5 – offers. Contact Mr T Ellis, Devon. Tel: (0752) 896077

● Master 512, mono monitor, manuals, Music 500, software, Dos Plus 2.1., only – £300. Contact Mr D Newton, Leicester. Tel: (0533) 546539

● A3000, 2Mb Ram, Taxan 775 multiscan colour monitor – £700 ono, also over 30 games and utilities, most half price, also BBC B and disc games – offers welcome. Contact Mr S Weet, Bath. Tel: (0225) 317513

● BBC Master with colour monitor, Philips RGB high resolution – £300 ono. Contact Mrs J Gailey, Middlesex. Tel: (0895) 233798

● Master 512, dual 80-track bridge unit, Mega 3 Rom, Spellcheck, Gem and Dos software, Amstrad printer – £500 ono, will separate. Contact Mr B Cook, Hereford. Tel: (0432) 266069

● BBC B, View, Viewsheet, 16K sideways Ram, Replay, two 40-track disc drives, Olivetti JP101, cassette recorder, lots of software, manuals – £250. Contact A Kimmins, Northants. Tel: (0604) 812478

● I am starting new PD company need loads of PD/shareware, will swap on 1-1 basis, send SAE and software and discs for returned PD to Gem PD, 15 Partridge Down, Winchester, Hants SO22 4HL

● Electron 64K/Turbo, Plus 3, Plus 1, sound expansion, games, View, Viewsheet, books, mags, plus lots more – £200 ono the lot. Contact Mr A Gilfillan, Nottingham. Tel: (0602) 617529

● Wanted: Memoco Electron robotic arm with position feedback and BBC interface card. Contact Mr J Myatt, Stoke-on-Trent. Tel: (0782) 523164

● Master 128, Cumana 40/80 track disc drive, manuals, Wordcraft, Home Office – £170. Contact Mr D Beaumont, Chesterfield. Tel: (0246) 273356

● Easiwriter wanted, will swap Pipedream 3 and Genesis, willing to consider Impression II, geniune reasons. Contact Mr G Anderson. Tel: (0309) 675300

● Star LC200, 9-pin dot matrix colour printer, manuals and Fanfold feed – £110 ono. Contact Mr J Phillips, Kent. Tel: (0732) 454707

● Archimedes 410/1, 4Mb Ram, 20Mb hard disc, colour monitor CM8833, software, PRM, manuals – £550. Contact Mr P Wesson, Oxford. Tel: (0865) 273846

● Wanted: BBC games on cassette, please write (enclosing list and asking prices) to Mr K McCan, 29 Iveagh Crescent, Belfast BT12 6AW

● Master 128, Opus 40/80 disc drive, colour monitor, Citizen 120D, manuals, software, 50 discs, Amx design Rom, Tracker Ball – £450. Contact Mr M Rutland, Sherborne. Tel: (0935) 872517

● BBC B, Watford 32K shadow Ram, Watford DFS, 40/80 track drive, Intersheet, Spellmaster, Star NL10 printer, Sanyo data recorder, no monitor. leads, manuals, games – £150 ono. Please contact K Fletcher, Hants. Tel: (0252) 620866

● Teletex Rom with adapter – £20, Viewsheet Rom, Wordwise Plus Rom, manuals – £10, for BBC B. Contact Mr J Slater, Ampthill. Tel: (0525) 840115

● BBC Issue 7, DFS, Aries B32 and B12 boards, Amx mouse and Stop press, exmon II, Sciways, ADI, Watford double plinth, good condition, manuals – £150. Contact Mr L Killip, Sussex. Tel: (0273) 844951

● Wanted: Serious disc software suit Master 128, need disc version of Starfinder by Heather Cooper/Century software, must run on Master 128. Contact R Rose, Cheshire. Tel: 061-439 7506

● Wanted: Urgently BBC Acorn User magazine or monthly cassette or monthly disc (40-track) for BBC B for January 1985. Contact Mr A Webb, Shropshire. Tel: (0746) 761859

● Acorn Electron software and hardware (+1 only), for sale, worth over £800, sell – £300 ono. Contact Mr J Watt, Kent. Tel: (0227) 459452

● Master 128, single 40/80 disc drive and assorted original games – £250, Amstrad DMP 3000 – £75. Contact M Price, Rutland. Tel: (0664) 79629

● Master 128K 65C102 co-processor, Microvitec medium resolution monitor, twin TEAC drives, Roms, manuals, programs – £325. Contact M Robertson. Tel: (0296) 23124

● Electron 32K, Plus1, 5.25in disc drive interface, tape recorder, View, Viewsheet, Rom database, games, all books, offers. Contact Mr A Summerscales, York. Tel: (0347) 22084

● Wanted: A disc copy of Tetris for BBC B. Contact Mr B Ferris, London SE4. Tel: 071-252 9044

● Joystick interface (Leading edge A5000 compatible) Plus 2 Superpro, unused – £42 (cost £62). Contact A Jeffery. Tel: (0278) 751 317

● BBC B, 40/80 track disc drive, DFS, cassette, Cub colour monitor (slight fault), some books – £180. Contact Mr M Milton, Bromley. Tel: 081-467 5427

● BBC Master, disc drive, monitor, printer, mouse, Amx Art and Pagemaker, Spellcheck, Music 5000 sythesiser and 4000 keyboard – £400 ono. Contact D Candish, Salisbury. Tel: (0722) 322977

● BBC B to PC, Torch graduate, 640K, 10Mb hard drive controller, twin floppy drive, Ast six pack, software, manuals – £200 ono. Contact Mr R Burley, Kent. Tel: (0634) 37715

● Scanlight Junior plus Computer Concepts scanner – £95, Vision black/white digitiser external – £39, Deltacat joystick – £15. Contact Mr T Dagger, Blackpool. Tel: (0772) 265421

● 2Mb A310M and colour monitor, 20Mb hard drive, Impression, Pipedream, Pro Artisan, Elite, Lemmings, Saloon Cars and many others – £700. Contact Mr J Quigley, Worthing. Tel: (0903) 204463

● BBC B games discs – £3-£5, tapes – £1-£2, Slave Rom – £5, Micro User 1985-89, Acorn User 1987-91, free. Contact Mr S Hennigan, Kent. Tel: (0634) 201470

● 1/0 expansion card AKA10– £50 ono, Poster – £40, Chameleon 2 – £20, Midnight graphics tracer – £20, Cartoon Line – £10, Computer Concepts extra boders disc – £5. Contact Mr J Bancroft, Northants. Tel: (0933) 317562

● Archimedes A310 and stereo monitor, Panasonic dot matrix printer, all boxed up as new, loads and loads of software – £570 ono. Contact Mr R Bielby, Southport. Tel: (0704) 24615

● Wanted: User interface Plus 1 for Acorn Electron. Contact T Jones, Cumbria. Tel: (09467) 28938

● A3000, 4Mb memory, Philips colour monitor, stand, Deltacat joystick, splitter box, much software, all boxed as new – £700 ono. Contact Mr P Taylor, Bradford. Tel: (0274) 674536

● Wanted: 3.5in disc drive for a Master Compact. Contact Mr E Smith, Newcastle-Under-Lyme. Tel: (0782) 615673

● BBC Master 128, colour monitor, disc drive, monitor stand, twin joysticks, Art package and software, excellent condition – £500. Contact Mr N Buckley, Kings Lynn. Tel: (0553) 673027 after 6pm

● Panasonic KX-P108 9-pin printer – £100, The Real McCoy – £15, Nevryon, Drop Ship, Speech, Apocalypse – £10 each, Tracker (music) – £30. Contact Mr N Maddock, Middlesex. Tel: (0895) 231011

● Electron accesories, Acorn Plus 1, joysticks etc – £25, Plus 3 3.5in disc drive – £40, books – £10, 70+ games – £50, all – £110. Contact Mr T Smith, Essex. Tel: (0376) 329687

● Master 128, colour monitor, double disc drive with power supply unit, Viewstore and Master Rom, extras – £350. Contact Mr A Ross, Nottingham. Tel: (0602) 654002

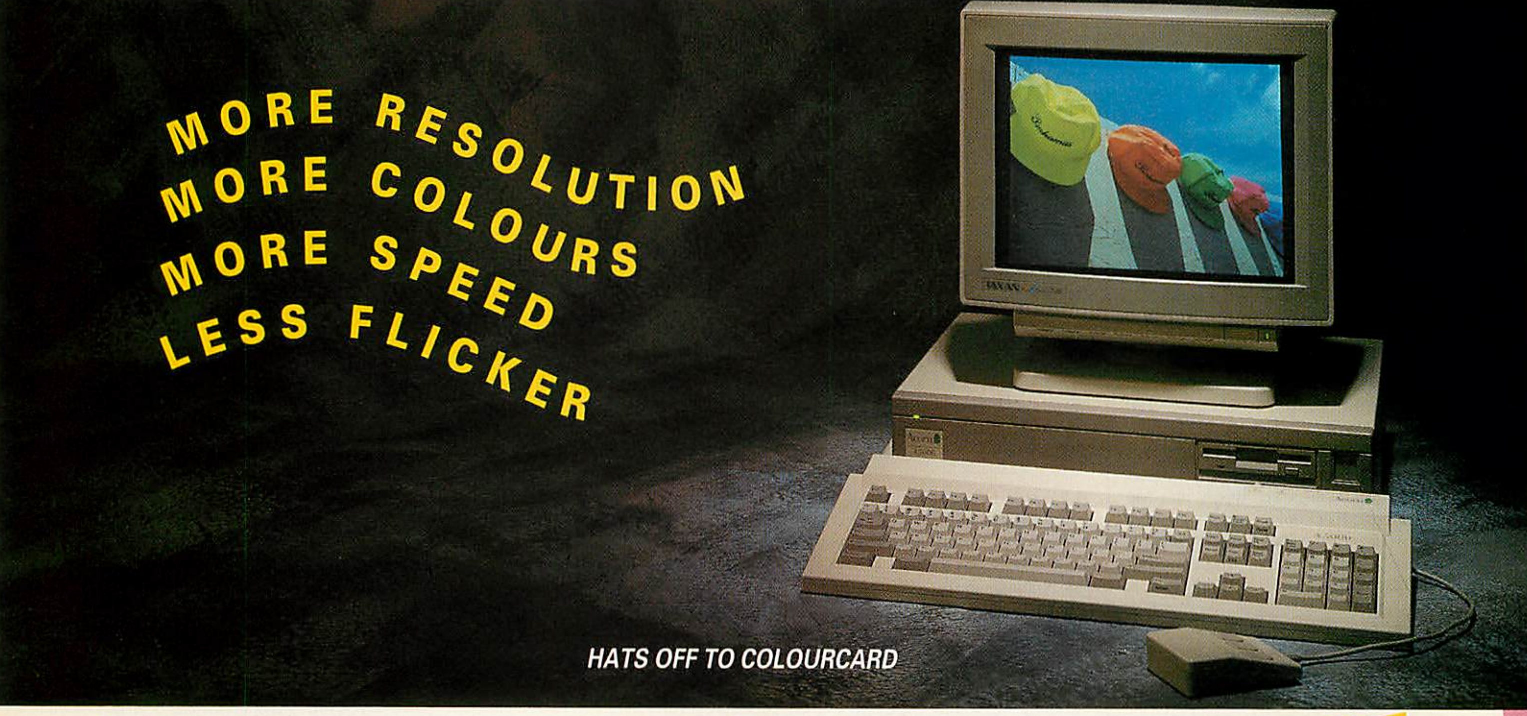
● Watford A3000 1/0 card – user/analogue/11C – £35, Watford 20Mb IDE hard disc drive (internal) – £150. Contact Mr V Robertson, Westhill. Tel: (0224) 743733

● Wanted: Archimedes contacts from all over the world to swap PD, 100% reply. Contact Mr R Barkhuysen, Elderenweg 11, 3770 Riemst-Millen, Belgium.

● Due to the huge backlog of free ads, there is no coupon this month. Please do not send in any ads until the coupon reappears. Normal service will be resumed as soon as possible.

THE ColourCard

FOR THE ARCHIMEDES



HATS OFF TO COLOURCARD



A new graphics accelerator card for the Archimedes, the ColourCard brings a host of improvements to the video capabilities of any Archimedes A300*, 400*, 540 or 5000 series computer.

The simple to fit, single width expansion card is completely compatible with all RISC OS desktop software, but brings much higher screen resolutions at higher screen refresh rates (less flicker and easier on the eye).

In 16 and 256 colour screen modes all the colours are selectable from 16 million hues. This means scanned pictures can be seen with 256 true grey-levels on screen and that you are no longer restricted to the preset Acorn palette. Some applications, such as ArtWorks, can provide better screen colouring using the new palettes.

In addition, the ColourCard offers 15 bit-per-pixel true colour screen modes having over 32,000 colours on screen at once. Although these screen modes are not yet desktop software compatible, it is expected that programs will become available that take advantage of the modes. The ColourCard is supplied with a 24-bit preview utility to show 24-bit Clear files in stunning full colour.

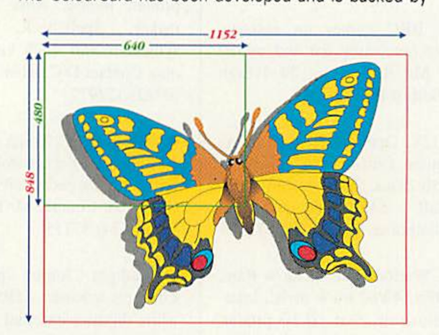
The ColourCard reduces the load on the main Archimedes memory and so allows the ARM processor to run much faster than would normally be possible in high resolution screen modes. Depending on machine and screen mode, graphic operations can be up to twice as fast.

The ColourCard revolutionises DTP and graphics work, and opens up the world of true-colour graphics to the Archimedes user for the first time.

The ColourCard has been developed and is backed by the largest and most successful Archimedes developer. It is available now, and for added peace of mind comes with a 14-day, no quibble money back guarantee.

SOME OF THE SUPPORTED SCREEN RESOLUTIONS

Colours	Resolution	Refresh
16 colours	1600 x 600	65Hz
	1024 x 768	72Hz
	1152 x 848	64Hz†
	1280 x 512	80Hz
256 colours	800 x 600	85Hz
	1152 x 424	80Hz
32,000 colours	800 x 300	80Hz
	576 x 424	90Hz



ColourCard offers 3 times the pixel area of standard Acorn VGA mode 27.

KEY COLOURCARD FEATURES:

- ArtWorks version1.1 now supports 32,000 ColourCard screen modes
- Video pass through for guaranteed compatibility with all software without having to unplug your monitor
- 15 bpp (ie 32,000 colour) screen modes
- No quibble money back guarantee
- A3000 version now available
- New configurable screen update speed

*(The ColourCard is compatible with all multi-scanning monitors. †Only higher scanning rate monitors can manage 1152 x 848 resolution. Lower scanning rate monitors may display some resolutions at lower refresh rates. *A300 and early A400 computers may need an additional Genlock connector to be fitted internally.)*

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IMPROVE YOUR MEMORY



Ill: JONNY MENDELSON Photo: RAPID EYE

However much memory you have it's never enough. David Lawrence looks at options for 8Mb of Ram on the A5000

More and more applications these days are only comfortable with 2Mb of memory, making 4Mb a must for many users. It is a well-known fact that junk expands to fill available space – just look in your attic for proof. This law also seems to apply to programs and computer memory. This may be a little pessimistic, but sometimes even 4Mb isn't enough, especially with 600dpi printouts. Two 8Mb expansions now exist for A5000s: both require the Memc to be removed from the main circuit board and replaced by a socket. The two suppliers: Risc Developments and Atomwide each offer their own options.

RISC DEVELOPMENTS

This consists of two cards. One contains all the DRam and it plugs into the memory expansion slot in the usual way. The second card contains the two Memcs necessary to handle the 8Mb; this plugs into the new Memc socket on the main board at one end and the Ram card at the other. A handful of glue chips provide the necessary synchronisation between the two Memcs. Two versions of the upgrade exist, depending on whether you have 2Mb or 4Mb of memory.

Although fitting takes two days, if you can't stand this period of separation, you can always turn up at Risc Developments' door and the people there should be able to perform the necessary surgery in a couple of hours – just enough time to see the sights of St Albans. Alternatively, and this is mainly aimed at foreign customers, it will supply a self-fit version. This involves delicate de-soldering so, ideally, get a qualified service engineer to do the work.

ATOMWIDE

Since the arrival of the A5000, Atomwide has been producing 8Mb boards to complement its 4Mb ones, but a new design has just been launched; this is the upgrade covered here. As with the Risc Developments upgrade, two boards are supplied: a Memc header card, containing the Memcs and a couple of synchronisation Pals, and a Ram card.

The header card plugs into the Memc socket but the main difference between the two products is that the Ram card plugs into the Rom sockets (the Roms themselves are removed and plugged into the Ram card). This means the extra 4Mb should function with most existing 2Mb machines upgraded to 4Mb (the card being plugged into the memory expansion slot). The two cards are connected with a 34-way, interleaved earth, ribbon cable. This new-style 8Mb design can also be installed in any pre-A5000, 4Mb machine by changing the Ram card; this will cost you £399. This also allows Risc OS 3 Roms to be installed in early machines.

CONCLUSION

Both upgrades are well-made and come from well-known companies. At the time of writing, Atomwide's is cheaper, but I suspect Risc Developments may well lower its price to match. However, in terms of performance there is little to choose between them.

PRODUCT DETAILS

Product: A5000 8Mb upgrade
Supplier: Risc Developments
Tel: (0727) 840303
Prices: 2 to 8Mb upgrade £499
4 to 8Mb upgrade £429
If you already have an upgrade from 2Mb to 4Mb with a Risc Developments or Acorn board, there is a £60 trade-in.
Carriage £8

Supplier: Atomwide
Tel: (0689) 838852
Price: 2 to 8Mb upgrade £449
4 to 8Mb upgrade £399 (wih any third-party 4Mb)
If you already have an old style Atomwide expandable card; 4 to 8Mb only costs £359
Carriage is included.

All prices exclude VAT

Watford Electronics Ltd

Established 1972

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Archimedes micro

System	Basic	Colour	Multiscan
A3010-1Mb Family	£424	£625	£769
A3010-2Mb L/C	–	£680	–
A3020-2Mb FD	–	£749	£799
A3020-2Mb HD60	–	£899	£949
A4000-2Mb HD80	–	£949	£999
A4000-Home Office	–	£999	£1049
A5000 No HD	£689	–	–
A5000-2Mb HD80	–	£–	£1399
A5000-L/C 2Mb HD80	–	–	£1445
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On-Site Maintenance now available on all Archimedes Micros. Please telephone for details.

Archi A4 Notebooks

A4 Notebook with 2Mb RAM	£1399
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FREE OFFER

When you purchase any of the above Archimedes Micros, we will give 10% of the value of the machine in Hardware or Software of your choice

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- Ethernet Card £149
- SCSI Card 8 bit £129
- SCSI Card 16 bit £149
- SID Utilities Discs – Set of 4 £19
- ST506 Hard Disc Controller Card £99
- A5000 Dust Cover £9
- A5000 Technical Reference Manual £65
- A4 Spare Batteries £49
- IDE ROM Upgrade for use with RISC OS3 £20
- CC Faxpack £289
- Colour Card £239

RISC OS 3 Upgrades

- A 5000 Software Upgrade Kit £16
- Software Upgrade Kit for the rest £40
- Hardware Upgrade Kit 300/440 £25



Watford Electronics Headquarters – Luton

Scan256 Grey Scale Scanning

If you need a 256 grey-scale hand scanner for your Archimedes then look no further.

Scan256 gives you up to 256 levels of grey at a maximum of 400dpi and is supported by state-of-the-art sophisticated software – **for only £185.** This makes it the only sensible scanning and image processing solution for the Acorn 32-bit range. Just compare these features:

- More than one copy of the image held in memory at once.
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A3010 DTP Pack

Supplied with 3.5" Floppy Disc Drive and a mouse, Colour Monitor and lead, TV modulator, 20Mb fast IDE Hard Disk Drive, 'Compression' utility to increase the Hard Drive capacity to typically 40Mb, the highly acclaimed Computer Concept's Impression Junior DTP package, EasiWord wordprocessor, Quest for Gold game, applications suite of software packages and comprehensive audio training tape.

RRP: £1095

Sale Offer Price: £739

- A3010 DTP Pack with Learning Curve £839
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Special Education discounts available on micros, RAM upgrades, ARM 3 Turbo Card, etc. Please write in or telephone:

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All our memory upgrades are simple to fit. No soldering required. Fitting instructions supplied.

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- **R305**-A3010 – to 2MB RAM Upgrade £39
- **R306**-A3020 – to 4MB RAM Upgrade £70
- **R311**-A305 – to 1MB RAM Upgrade £30
- **R312**-A305/310 – to 2MB RAM Upgrade £85
- **R314**-A305/310 – to 4MB RAM Upgrade £229
- **R412**-A410/1 – to 2MB RAM Upgrade £25
- **R413**-A420/1 – to 4MB RAM Upgrade £50
- **R414**-A410/1 – to 4MB RAM Upgrade £75
- **R810**-A410/1 – to 8MB RAM Upgrade £399
- **R820**-A420/1 – to 8MB RAM Upgrade £375
- **R840**-A440/1 – to 8MB RAM Upgrade £315
- **A5000** – to 2MB additional RAM Upgrade £82

Desk Top Publishers

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Hi-Speed, Low Cost Archi Hard Disc Drive

Watford's advanced interface allows IDE drives to work on any Archimedes machine, speeds in excess of SCSI devices can be obtained at a fraction of the cost of a SCSI drive.

Up to four drives are supported by the IDE filing system IDEFS, up to two drives can be attached to each expansion card, up to four cards can be installed in a machine.

A powerful security feature has been provided with the two unique commands *IDELock and *IDEUnlock, ideal for educational establishments where hacking or tempering may be prevalent that may lead to loss of data. Once locked, the configuration can not be changed until a secret password is used. The !IDEForm Write Protect option is particularly useful in conjunction with *IDELock as it will prevent any unauthorised deletion of data.

By an innovative use of on-board memory, the card will remember its configuration, even if moved to another slot or even a different machine, this also includes the unique security features.

Hardware

- Supports proposed ANSI ATA (IDE) specification
- Fast 16 bit MEMC interface interrupt driven to support background disc operations
- 5 Mbytes per second peak transfer rate
- Up to two drives (master and slave) per card
- Multiple cards per machine (up to four)

Software

- All software supplied in ROM
- Filing system 'IDEFS'
- Desktop filer with drive ready detection and disc name under icon
- !IDEForm, WIMP based configuration and formatting software
- Drives can be individually write protected
- Power saving standby modes supported with configurable timeout
- Drives can be used without translation in native mode for minimum overhead
- !IDEFSDisk, creates PC emulator hard discs

Prices

Part No.	Capacity	Access Speed	Price
ADA 0520	44Mb	28mS	£189
ADA 0530	100Mb	16mS	£259
ADA 0570	200Mb	15mS	£369
ADA 0580	330Mb	15mS	£599

All above 3.5" Drives are supplied complete with Controller Card & cable for use with A300/A400/A500 series machines.

AAA 0300 External Case & PSU for A3000	£85
AEA 1060 Archi IDE Hard Disc Podule only	£89

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ADA 0940	100Mb	16mS	£195
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A5000 2nd Internal IDE Hard Drive

ADA 0960	100Mb	16mS	£205
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ADA 1010	330Mb	15mS	£535
ADA 1040	80Mb	17mS	£195

Internal Hard Disc Drives for A3000/A3010

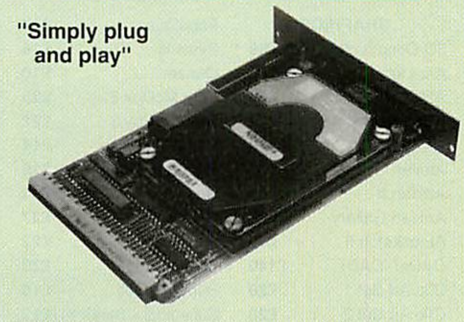
State of the art, 4 layer internal IDE Hard Cards for the A3000. Software supplied in, On-board ROM.

ADA 0150	20Mb	19mS	£149
ADA 0770	30Mb	19mS	£185
ADA 0750	60MB	18MS	£259
ADA 0720	80Mb	18mS	£299
ADA 0730	120Mb	16mS	£395

Supplied ready assembled. No soldering required. Simply plug into the allotted space.

Archi IDE Hard Cards

"Simply plug and play"



Watford's easy to instal, low cost, high performance, revolutionary IDE Hard Cards for the A300 & A400 series Archimedes.

ADA 0650	20Mb	19mS	£159
ADA 0800	30Mb	19mS	£195
ADA 0660	40Mb	28mS	£289
ADA 0890	60Mb	18mS	£299
ADA 0670	80Mb	18mS	£309
ADA 0680	120Mb		£405

(All above Hard Cards can be used as Removable Hard Drives. Ideal for Military and Education use.)

Archi to BBC Serial Link Mk 2

Using this simple data link, it is possible to solve all your BBC to Archimedes data transfer problems. The kit is supplied with a disk, and the necessary cable to connect the two computers.

New RISC OS Version also available (please specify)

- For A3000 £15 • For A5000 £16

For A3000 Serial Upgrade (£19) required

Cortian CKAI Interface

Eliminates need to have a User port in A3000/305/310/400/540 when using Concept Keyboard. £29

Concept Keyboards

• A4 Standard Pack	£95
• A4 Primary Pack	£100
• A4 Designer Pack	£110
• A3 Standard Pack	£99
• A3 Primary Pack	£105
• A3 Designer Pack	£110
• Universal 2010 Keyboard A3	£115
• Universal 2010 Keyboard A4	£110

A3000 I/O Card (User, Analogue & IIC)

This NEW versatile I/O Card from Watford, fits inside the A3000 and includes an Analog to Digital Converter, a User Port, and an InterIC (IIC) connector.

The card allows many of the peripherals developed for the BBC to be used with the Archimedes A3000. The ADC and User Port have the same pin out and connectors as the BBC computers.

Extensive RISC OS software is supplied to provide BBC OSBYTE calls for support of the ADC and User Ports, including the BASIC keyword ADVAL. The software provides extended RISC OS support for separate interrupts from both the ADC and User Ports, permitting easy interrupt driven operation.

The card is provided with all the software in ROM and is automatically loaded when the machine is turned on.

Peripherals connected to the ports can obtain up to 500mA of power at +5V. A fuse is fitted to the card to protect the A3000 from damage arising from accidental short circuit of the power output.

Features

- An 8 bit User Port with a standard 20 way IDC connector, compatible with the User Port on the BBC computers and the Archimedes I/O Podule.
- A 10 bit Analog to Digital Converter with a standard 15 way D type connector, compatible with the ADC on the BBC range of computers and the Archimedes I/O podule.
- An InterIC (IIC) Port with a 5 pin DIN socket to connect the A3000 to external IIC devices. **£38**



CREDIT CARD 24 HOUR Ansaphone Hot Lines (0923) 250234 or 233383

Leasing finance at very attractive rates now available to Businesses (subject to status), Schools, Colleges, Universities, Government Depts. and Local Councils. Minimum order £1,000. Please telephone for details.

Archimedes External Disc Drive Interface

With this interface it is possible to connect almost any 5.25"/3.5" disc drive with its own power supply to the Archimedes. Upto 4 disc drives can be connected. Fully Buffered Board. NO SOLDERING is involved. Supplied complete with necessary lead. **Price £21**

Back Plate Extension

- A300/400 £15; • A3000 £14

ARM 3 Turbo Card MkII

Simply The Best



Here it is at last – the all new Mark 2 version of Watford's highly acclaimed ARM 3 processor board for the Archimedes and now also the A3000 series computers. Using the latest surface mount technology on a high quality four layer circuit board we have reduced the overall size to a mere 53mm x 45mm, and the cost to only £145. Mk II upgrade will increase the speed of your micro by a factor of 3 to 6.

Any competent A300 or A400/1 series micro owner can fit the upgrade himself, as we provide full fitting instructions and a special ARM chip extraction tool. However for A3000 micros and those not wishing to perform the upgrade themselves, we will collect, upgrade and return your micro by courier service, at an additional cost of £24.

(A300 and old A440 series owners please note – you will need to upgrade to MEMC1A for ARM3 to work.)

RRP £249

Special Offer £145

Acorn have satisfactorily evaluated Watford's ARM 3 upgrade and the A3000 upgrades are fitted by Acorn approved surface mount technology centre, therefore its fitment will not invalidate Acorn's warranty on the micro.

BBC/Master Accessories

Econet Module for the Master	£42
Twin ROM Cartridge for Master	£9
Quad ROM Cartridge for Master	£14
Master Reference Manual I	(No VAT) £14
Master Reference Manual II	(No VAT) £14
Master Advance Ref Manual	(No VAT) £14
64K Upgrade Kit for B+	£32
ECONET Upgrade Kit for BBC B	£42
ALL ECONET UPGRADES Available	
ARIES' IEEE Interface for BBC B & Master	£238

Low Cost Finance now available, subject to status. For further details, please contact our sales team.

Continued→ → → → → → → → → →

BBC Education Software

Title	Description	Price
A vous la France	French programs for beginners	£29
Au restaurant/Accident de route	French games for 12 years +	£26
Bolougne and oh les	French program for beginners	£26
Computer control	Program simulating computer control	£26
Computers at work	Primary education program	£17
Espana Viva	Spanish educational programs	£20
Folks Tales	Listening and reading for ages 7+	£22
Geordie Racer	Look and read for ages 7+	£22
Hall of Mirrors	Practice word & number skills	£22
Help your child learn basic mapwork 2		£18
Inside Science	Four common science subjects	£22
Letters and pictures	Educational programs for 6-8 years	£15
Make a wildlife garden	Explore wildlife/weather/garden growth	£22
Maths with a story 1	Primary level maths programs	£20
Maths with a story 2	4 further maths programs	£20
Note invaders	Learn sheet music for 7-Adults	£15
Numbers & Pictures	Early number learning (4-6 years)	£15
Picture craft	Geometrical design & Colouring	£17
Puncman 1 & 2	Learning Punctuation (7-13 years)	£15
Puncman 3 & 4	Learning Punctuation (8-14 years)	£15
Puncman 5, 6 & 7	Learning Punctuation (8-15 years)	£15
Ramayana Tales	Simple Desktop Publisher using pictures & characters from the Ramayana	£22
Skyhunter	Look and read educational adventure	£22
Technology and design	Problem solving programs	£22
Through the dragons eye	Adventure game and Map reading	£22
Fun School 3 (Under 5)	Varied range of Education subjects	£17
Fun School 3 (5-7)	Varied range of Education subjects	£17
Fun School 3 (Over 7)	Varied range of Education subjects	£17

Archi Educational Software

- 10 out of 10 Early essentials £20
- 10 out of 10 English £20
- 10 out of 10 Maths £20
- Animated Alphabet (3-6 yrs) £21
- Arcventure (8-12 yrs) £29
- Bookbinder £43
- Bumper Disc £14
- Bumper Disc 2 £14
- Craftshop 1 £19
- Craftshop 2 £19
- Converta-Key £16
- Data Word £16
- Desktop Stories £35
- DigiSim £35
- Dream Time (5-7 yrs) £23
- Farm (5-7 yrs) £19
- Fleet Street Phantom (9-13 yrs) £25
- Fun School 3 Red (up to 6 years) £17
- Fun School 3 Green (6-8 years) £17
- Fun School 3 Blue (8 years +) £17
- Gate Array Teaching System £68
- Glimpse Clip Art Utility (7-16 yrs) £8
- Highlighter (6-16 yrs) £42
- Jigsaw £19
- Mapventure (9-13 yrs) £24
- Microbugs £24
- Money Matters £16
- Nature Park Adventure (7-9 yrs) £27
- Numerator £60
- Picture Book £16
- Recall (6-13 yrs) £39
- Sellardore Tales £24
- Snippet £36
- Space Mission Mada (9-13 yrs) –
- Sting of the Dump (9-13 yrs) £22
- Viewpoints (9-12 yrs) £33
- Wizard's Revenge (7-10 yrs) £17
- Worst Witch (7-10 yrs) £25

Archimedes Software

GRAPHICS

Title	Price
3D Construction Kit	£39
Arc Light	£46
ARCtist	£19
ARCticulate	£19
Art Works	£129
Atelier	£60
Artisan II	£45
Artisan Gallery	£16
Autosketch II	£65
CADet (CAD)	£140
Clip Art Set 1	£28
Clip Art Set 2	£28
Concept Designer	£23
Craftshop 1 & 2	£28
Euclid 2	£50
Graph Box	£59
Graphbox Professional	£107
HotLink Presenter	£40
Illusionist	£69
Kermit	£46
Mogul	£17
PCAD Educ.	£395
Poster	£75
Pro Artisan	£70
ProCAD	£475
Prime Art	£46
Render Bender 2	£79
Revelation 2	£80
Titler	£119
Tween	£29

GAMES

Title	Price
Air Supremacy	£17
Apocalypse	£14
Arcade 3 Compilation	£12
Battletank	£10
Black Angel	£27
Boogie Buggy	£14
Break 147 + Supa Pool	£19
Bughunter in Space	£12
Cataclysm	£19
Caverns	£10
Champions	£25
Chess 3D	£16
Chocks Away	£27
Compendium	£32
Chocks Away Extra	£14
Chuck Rock	£18
Conqueror	£15
Cyber Chess	£38
Cycloids	£20
Ego Repton 4	£–
Elite	£33
Enter the Realm	£19
E-Type Compendium	£20
E-Type Designer	£13
Fervour	£35
Galactic Dan	£19
Gods	£24
Grievous Bodily Arm	£19
Hero Quest	£25
Holed Out Designer	£13
Holed Out Golf Comp	£20
Inter Dictor 2	£26
Iron Lord	£15
Jahangir Khan Squash	£19
Lemmings	£20
Oh no more Lemmings	£15
Lost Temple	POA
Lotus Turbo Challenge	£19
Mad Prof Mariarti	£17
Masterbreak	£16
Man at Arms	£14
MahJong Patience	£15
Manchester United II	£19
Nebullus	£21
Nevryon II	£20
Omar Sharif's Bridge	£23
Pandoras Box	£18
Pipe Mania	£17
Play It Again Sam	£–
Populous	£23
Pysanki	£14
Quazer	£10
Real McCoy 2	£23
Real McCoy 3	£22
Redshift	£14
Return to Doom	£16
Repton 3	£14
Saloon Cars Deluxe	£27
Sim City	£22
Spitfire Fury	£22
Superior Golf	£14
Superpool + Break 147	£22
Swiv	£19
Talisman	£12
Techodream	£20
Trivial Pursuit	£22
Twin World	£15
U.I.M.	£23
White Magic 2	£15
Worldscape	£16
XFire	£19
Zelanites	£23

Miscellaneous

Title	Price
Ancestry	£59
Arccomm 2	£38
Arcterm 7	£64
Armadeus Sound	£60
Avante Garde Fonts	£23
Battle Chess	£25
BBC DFS Reader	£6
Broadcaster Loader	£65
Chameleon	£34
Chart Well	£25
Chatter	£34
Compression (CC)	£38
Craftshop 1	£27
Craftshop 2	£27
Desk Edit 2	£29
Equasor	£38
FlexiFile	£97
Genesis	£10
Genesis Plus	£68
Genesis 2	£99
Investigator 2	£22
Magpie 2	£42
Notate	£42
Numerator	£66
Pin Point	£65
Polyglot	£16
Presenter 2	£29
Presenter Story	£145
Prophet Accounts	£132
Prophet Demo Disc	£10
Rainforest	£17
Revelation 2	£95
Rhapsody in Blue 2	£45
Score Draw	£46
Show Page	£127
Speech!	£15
The Victorian	£17
Time Tabler	£549
Toolkit (Clares)	£35
Touchtype	£40
Tracker	£39
Turbo Driver BJ10E	£42
Type Studio	£43
Vox Box	£46
Wimp Programmer's Toolkit	£16
WorldScape	£17

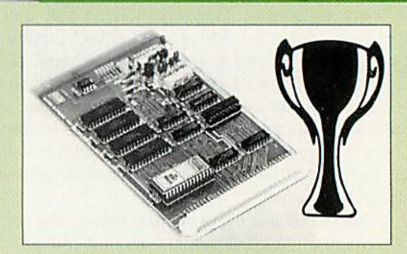
LANGUAGES

Title	Price
Desktop C	£199
Macro Assembler	£40
Robo Logo	£69
BASIC Compiler	£77
Logotron Logo	£45
Risc BASIC	£120
Risc FORTH	£110
Cambridge Pascal	£95

BBC/Master Games

Title	Price	Title	Price
Acornsoft Hits 1	£10	Sim City	£10
Acornsoft Hits 2	£10	Superior Collection 1	£10
Air Supremacy	£10	Superior Collection 2	£10
Play It Again Sam 1	£10	Play It Again Sam 9	£10
Play It Again Sam 2	£10	Play It Again Sam 10	£10
Play It Again Sam 3	£10	Play It Again Sam 11	£10
Play It Again Sam 4	£10	Play It Again Sam 12	£10
Play It Again Sam 5	£10	Play It Again Sam 13	£10
Play It Again Sam 6	£10	Play It Again Sam 14	£10
Play It Again Sam 7	£10	Play It Again Sam 15	£10
Play It Again Sam 8	£10	Play It Again Sam 16	£10

Archi Real-Time Digitiser



Now supplied with NEW RISC OS Version Software

Watfords' Archimedes Video Digitiser is the most sophisticated digitiser ever designed for a micro. It provides a fast and flexible means of capturing images from a video camera or recorder for display and manipulation on the Archimedes range of Micros. Off-air televison signals may also be digitised via a video recorder or TV tuner. Please write for further details.

Price £75

A Set of Colour Filters for colour image grabbing using a video camera £16

Archi Graphic Tablet



Special Price £199

(Price includes Tablet, Leads, Software & Puck)
Stylus Optional Extra **£20**

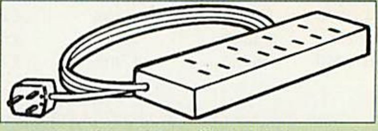
Archi Graphic Tablet Junior. Working area 9" x 6". Price includes Stylus **£105**

Surge Protector Plug

Fitted in place of your normal mains plug, this device protects your equipment (and data from corruption), against mains high voltage translent spikes/surges caused by lightning or thermostats switching.

Protection for only **£8.50**

4 Way Mains Distribution Socket



4 way top quality mains trailing sockets.
Supplied wired up with mains plug ready for use.
Can be screwed to floor or wall if required.
Very useful for tidying up all the mains leads from your peripherals.

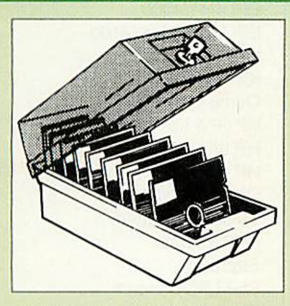
£9.50

Aries Spike Cleaner Unit

A 4 way mains distribution unit as above with a built-in Surge Arrester, providing protection for your complete Computer/Hi-Fi System

£16

Antistatic Lockable Disc Storage Units



- **M35** – holds up to 50 5.25" discs £4.95
- **M85** – holds up to 95 5.25" discs £6.95
- **M25*** – holds up to 25 3.5" discs £4.95
- **M50** – holds 50 3.5" discs £6.50
- **M100** – holds 100 3.5" discs £6.99
- **M10** – holds 8 of No. 10 Data Cartridges £15

* Not lockable

Disc Plonker Rack



When using ones micro, there is a tendency to have more than one Disc on the desk. This exposes them to the hazards of fingerprints, scratches, dust, coffee and an untidy desk. Why not protect your valuable data from all these hazards with the help of our extremely handy and low cost DISC PLONKER RACK. Holds up to eight 5.25" discs.

£2

3M – Diskettes

Lifetime warranty on 3M Discs

- *10 x 5.25" S/S D/D 40T (744)* **£5**
- *10 x 5.25" D/S D/D 40T (745)* **£5**
- *10 x 5.25" S/S D/D 80 Track (746)* **£6**
- *10 x 5.25" D/S D/D 80 Track (747)* **£7**
- *10 x 5.25" 1.6M D/S D/D High Density for IBM XT and AT* **£8**
- *10 x 3.5" S/S D/D 40/80 Track* **£6**
- *10 x 3.5" D/S D/D 40/80 Track* **£6**
- *10 x 3.5" Double Sided High Density* **£10**

Top Quality Diskettes

Watford's life time guaranteed disc are supplied complete with self stick labels & plastic library case.

- *10 x* ***M3*** *3.5" D/S D/D 80 Track* **£6**
- *10 x* ***M9*** *3.5" D/S High Density* **£10**
- *10 x* ***M4*** *5.25" S/S D/D 40 Track* **£5**
- *10 x* ***M5*** *5.25" D/S D/D 40 Track* **£5**
- *10 x* ***M7*** *5.25" D/S D/D 80 Track* **£6**
- *10 x* ***M8*** *5.25" D/S H/D Hi-Density* **£9**

Special Bulk Offer Discs

(Lifetime warranty on Discs)

BULK PACK DISCS in lots of 100

Type	S/S 40T	D/S 40T	D/S 80T
• Without Sleeves 5.25"	£25	£30	£35
• With Sleeves 5.25"	£28	£33	£38
• 3.5" D/S D/D	£21 for 50	£39 for 100	
• 3.5" D/S H/D	£40 for 50	£75 for 100	

Disc Drive Power Leads

Supply from BBC power supply to standard Disc Drive Connection: Single **£3.00**; Dual **£3.75**

Disc Drive Interface Leads

BBC to Disc Drives Ribbon Cable
Single **£4** Twin **£6**

3.5" Disc Drive



These top quality 3.5" Double sided, 80 track, are attractively finished in BBC beige. They are supplied complete with all cables and a Utilities Disc.

Type	Description	
	Disc Drive without PSU	
• **CLS35:**	Single Disc Drive, 400K	£59
• **CLD35:**	Twin Disc Drives, 800K	£109
	Disc Drive with PSU	
• **CS35:**	Single Disc Drive, 400K	£82
• **CD35:**	Twin Disc Drives, 800K	£126

(P.S. CS35 is supplied in a twin case with a blanking plate to enable easy expansion to a dual drive at a later stage)

Disc Drives in Monitor Stand



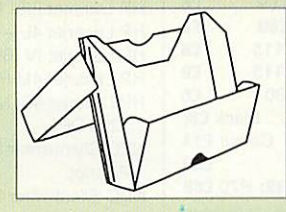
• **CDPM 800S** – Twin 5.25", 800K Double sided 40-80 track switchable disc drives mounted in an attractively finished Beige colour plinth for the BBC B & Master 128K micros. Supplied complete with integral power supply, cables and Utilities disc. The mains switch with neon On/Off light indicator, and the two 40/80 track switches are mounted on the front panel for ease of use.

£150

• **DP35 800** – Same as above except, one disc drive is a 5.25" and the other is 3.5".

£145

Plastic Library Cases



- **DLC1** – Holds 5 x 3.5" Discs. **£1.50**
- **DLC2** – Holds 10 x 3.5" Discs. **£1.90**
- **DLC3** – Holds 5 x 5.25" Discs. **£1.60**
- **DLC4** – Holds 10 x 5.25" Discs. **£2.00**

Disc Albums

Attractively finished in leather-look PVC Vinyl

- **DW1** – Holds 6 x 3.5" Discs **£2.50**
- **DW2** – Holds 6 x 5.25" Discs **£3.00**
- **DW3** – Holds 20 x 5.25" Discs **£3.50**
- **DW4** – Holds 40 x 3.5" Discs or 5.25" Discs **£4.50**

Floppy Head Cleaner Kit

The heads in floppy drives are precision made and very sensitive to dirt. The use of Cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. it is very simple to use. Available in 3.5" & 5.25", please specify.

Price £4

Acorn & Watford DFSs

- Watford sophisticated DFS ROM **£16.00**
- Watford DFS Kit complete **£49.00**
- DFS Manual (comprehensive) **£6.95**
- Acorn DNFS ROM **£17.00**
- Acorn ADFS ROM only **£25.00**
- Acorn 1772 DFS ROM Kit **£49.00**
- Acorn DFS Kit complete **£48**

Watford's MkII 1772

Single/Double Density DFS

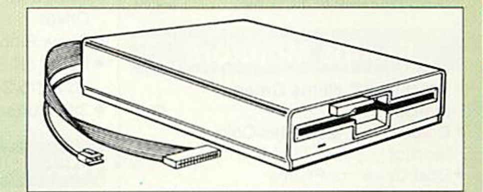
Many of our customers have wanted to use our superior DDFS and Acorn ADFS together. Now our Mk II DDFS Board with its 1772 Disc Controller, has been adapted to allow the use of Acorn ADFS as well. It also has all the commands of the Acorn's 1772 DFS, plus many more added features.

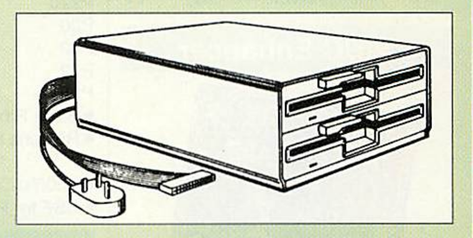
- Complete Kit — Special Price **£44**
- DDFS Manual — (No VAT) **£6.95**

Quality Disc Drives from Watford

All our Disc Drives are Double Sided and will operate in both Single and Double Density modes. All 5.25" Disc Drives are 40/80 track switchable. For ease of use, the switches are front mounted. Follow the trend with a Watford plinth. *(Turn to the 6th page of our advert for the Plinths).*
P.S. All our 5.25" Disc Drives with PSU are compatible with the Compact Micro. All you require is our special Compact Disc Drive cables designed by us.

"Test Bureau Approved for Use in Education"





Our Disc Drives conform to BS415

Type	Description	
	Disc Drive without PSU	
• **CLS400S:**	Single, 40/80 track 400K Double sided Drive	**£70**
• **CLD800S:**	Twin, 40/80 track, 800K Double sided Drives	**£138**
	Disc Drive with PSU	
• **CS400S:**	Single, 40/80 track, 400K Double sided Drive	**£80**
• **CD800S:**	Twin, 40/80 track, 800K Double sided Drives	**£149**

Special Cable to connect both 3.5" and 5.25" Disc Drives simultaneously to the BBC Compact £13

Continued→ → → → → → → → → →

Microvitec Monitors

- **1431** – Standard Resolution Monitor #£175
- **1451** – Medium Resolution Monitor #£215
- **Cub3000** Medium Res for A3000 #£195
- Dust Cover for Microvitecs £5.50
- **Touchtec 501 Touch Screen** £239
- **Touchtec 3000** £–

Includes 3 years parts & labour warranty

Multiscan Colour

Eizo F550i	£749
Eizo T560iT	£1345
Eizo T660i-T 20"	£1655
Eizo 9060	£398
NEC 2AN	£269
NEC 3FG	£350
NEC 4FG	£517
NEC 5FG	£975
NEC 6FG	£1739
Taxan 787	£238
Taxan 787LR	£265
Taxan 795PC	£465
Taxan 875+	£729
Taxan 875+ LR	£799
Taxan 970	£1225
VIDC Enhancer	£25

Aries AlphaScan Monitor

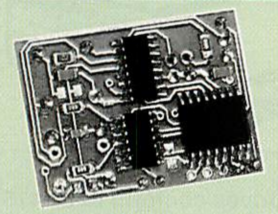
Its multiscan circuitry provides automatic adjustment for frequencies between 31 and 56KHz horizontal, and 43 and 70Hz vertical. Its 0.28mm dot pitch high resolution tube provides super sharp text graphics, while a high speed (70/72Hz) refresh rate provides a flicker-free display easing the eye strain. The VIDC Adaptor supplied with the monitor allows high resolution operation in all screen modes. **£325**

- Aries Alphascan 17" Plus £585

Philips Monitors

- **BM7502** 12" Hi-res Green Monitor £88
- **CM8833** 14" Med. Res Colour Monitor £195
- Dust Cover for Philips Monitors £6
- Spare Monitor Leads (various) £7

VIDC Enhancer



This unique VIDC add-on board for the Archimedes, caters for all types of Multiscan and VGA monitor and mode requirements. There are 2 versions to suit all requirements. The multimode software supplied, provides all the new modes for the selected monitor type, including the now standard Computer Concepts modes. With VGA monitor, you are no longer restricted to a few modes. A Desk Top application supplied on disc, allows new modes to be designed and existing modes to be modified for particular monitors.

Super VGA VIDC Card: Its unique design allows the horizontal and vertical sync to be buffered and have the polarity changed under software control **£45**

MultiVideo VIDC Card: As above but for MultiScan monitors only. **£25**

Integrex Ink Jet Printers

Colour Jet 132 Printer	£425
Paper Roll	£6.50
BBC Screen Dump Software	£10
Colour Cartridge	£21
Black Cartridge	£12.40
100 A4 OHP transparencies	£55
8K Serial Interface Optional	£123
Colour Jet 2000	£599
Betajet Ink Jet Printer	£185
Betajet Cut Sheet Feeder	£43
Integrex Colourjet Series 2	£335
Auto Sheet Feeder for Series 2	£45

Printer Leads

- BBC Centronics 4' £5; 6' £6
- Archi Parallel 2m £5; 5m £9; 10m £13
- PC Parallel 2m £5; 5m £9; 10m £13
- 25 pin D Male/Male 2m £5; 5m £10
- Centronics Double Ended 4' £5
- Centronics Double Ended 6' £6
- RS232 Leads Various £POA

Star Printers

	Printer	CSF	Ribbon
LC15	£190	£119	£4
LC20	£104	£69	£4
LC100C	£126	£69	£12
LC24-15	£245	£119	£5
LC24-100	£143	£69	£5
LC24-20 Mk2	£169	£69	£5
LC24-200C	£214	£69	£12
LC200 C	£151	£69	£12
SJ-144	£POA	–	–
STAR JET	£169	£43	£16
XB24-200C	#£324	£80	£12
XB24-250C	#£389	£139	£12
ZA-200C	#£260	£–	£12
ZA-250C	#£324	£–	£12

Includes 12 months on-site warranty

- Star/Archimedes Colour Printer Driver £15
- Black Ribbons for Colour Printers £5
- Serial 8K Serial Interface LC10/15/24/200 £52
- 32K Buffer LC/XB24-10; 15; 200 £52

NEC Pinwriter Printers

	Printer	CSF	Ribbon
P220	£189	£59	£6
P30	£235	£59	£6
P62	£342	£89	£8
P72	£406	£115	£8
P90	£579	£115	£8

- Black Ribbons for P20; P30 £6
- Ribbons for P60/70/P90 Black £8; Colour £14
- P60/70 Colour Option Kit £59
- CSF for P20 £59; P60 £89; P70 £89

Panasonic Printers

	Printer	CSF	Ribbon
KX-P1123	£126	£59	£6
KX-P1170	£98	£59	£6
KX-P1624	£264	£126	£8
KX-P1654	£330#	£126	£8
KX-P1695	£267	£126	£8
KX-P2123M	£144	£79	£8
KX-P2123C	£194	£79	£15
KX-P2124	£215	£89	£8
KX-P2180M	£126	£79	£8
KX-P2180C	£143	£79	£15
KX-P2624	£269#	£126	£8

Includes 12 months on-site warranty

- Dustcover for 80 column printers £6
- Serial Interface for above Printers £46
- Black Ribbons for P1081, 1180, 1124 £6
- Brown, Blue or Red Ribbons for KX-P1081/1592/1595/1695 £9 each
- 32K Buffer for above Printers £16

P.S. We only sell original Panasonic Ribbons which are guaranteed to last 3 million characters

Citizen Printers

120D+	£98	Swift 200	£178
Swift 9	£145	Swift 240	£200
Swift 9X	£185	Swift 240C	£212
PN-48	£189		
ProJet	£299	Swift 24X	£299

- AH29804 Manual Cut Sheet Feeder for Swift 9/24/124. Holds 50 Sheets £29
- Cut Sheet Feeder for 80 col. printers £75

+ FREE 2 years Parts and Labour warranty on all Citizen Printers

- Swift 9 Colour Option £19
- Swift 24 Colour Option £29
- Swift 24 Ribbons Black £4 Colour £13
- Swift 24X Ribbons Black £8 Colour £16
- Citizen/Archimedes Colour Printer Driver £15
- Citizen 120D Ribbons £3.50

Laser Printers

All Laser Printers (excluding HP Laserjets) include 12 months On-site maintenance

Brother HL4-VE	4ppm	£594
Brother HL4-PS Postscript	4ppm	£974
Brother HL-10V	10ppm	£1045
Brother HL10PS	10ppm	£1329
Brother HL10DV	10ppm	£1149
Brother HL10DPS	10ppm	£1445
Canon LBP4 LITE	4ppm	£492
Canon LBP4+ 1.5M RAM	4ppm	£644
Canon LBP-8III Plus	8ppm	£945
Canon LBP-8 plus IIIR	8ppm	£1435
Canon LBP-8 IV 600 DPI	8ppm	£989
Epson EPL4300	6ppm	£475
Epson EPL5200 – NEW –	6ppm	£565
Epson EPL7500	6ppm	£1139
Epson EPL8100	10ppm	£920
Fujitsu VM600	5ppm	£579
Fujitsu VM800 (Best Buy)	8ppm	£535
HP Laserjet IIIP	4ppm	£639
HP Laserjet IIISi PS	16ppm	£POA
HP Laserjet 4L – NEW	4ppm	£515
HP Laserjet IV (600 dpi)	8ppm	£1075
HP Laserjet 4M PS	8ppm	£1425
HP Laserjet 4Si MX 1200 DPI	16ppm	£2329
NEC Silentwriter S62P P/script	6ppm	£994
NEC Silentwriter 266	8ppm	£669
NEC Silentwriter 290P P/script	8ppm	£1469
NEC Silentwriter S102	8ppm	£995
OKI OL400E	4ppm	£449
Panasonic KX-P4410	5ppm*	£462
Panasonic KX-P4430 Satin Print*	5ppm*	£594
Panasonic KX-P4451	11ppm*	£919
Panasonic KX-P4455 Postscript	11ppm*	£1249
Star LP-4 Postscript	–	£774
Star LP-8 III 2	8ppm	£1249
Star LP-8 III	8ppm	£899
Star LP-8 Star (post)script	8ppm	£1130
Star LS-5	5ppm	£489
Star LS-5 EX (RISC Based)	5ppm	£599
Star LS-5 TT True Type + Mac	5ppm	£775

* Now with 2 years On-site warranty

HP Laserjet IIIP 3 years on-site	£150
HP Laserjet IIISi 3 years on-site	£450
HP Laserjet 4/4M 3 years on-site	£170

Laser Toners

Canon 2, 3 & 4	£52
Epson GQ	£13
EPL4/41/4300	£55
EPL7100/7500/8100	£117
KX-P4420/50/55	£20
KX-P4410/30	£29
Qume Crystal (3)	£75
HP IIP & IIIP	£54
HP II/D, III/D	£60
HP 4 & 4M	£72
OKI OL400/800	£48
VM800 8K pages	£99
NEC SWriter	£84
Star LP4	£52
Star LP8/Canon 8	£59
Star LS 5	£69

Laser RAM Upgrades

Type	1M	2M	4M
IIP; III/P	£49	£80	£132
II & IID	£60	£96	£142
LJ4/4M	£–	£75	£175
	8M/£279		
EPL4100	£–	£120	–
	512K/£52		
Canon LB8	£139	£275	–
KX4420/50i	£59	£89	£149
NEC S62/S102	£99	£180	–
Star LPB	£139	£275	–

Laser Drum & Developer

- Epson Drum GQ5000 £93; EPL7100 £129
- Panasonic 4420 Drum £60; Developer £80
- Panasonic 4450 Drum £93

Jetpage Postscript Cartridge

- HP IIP/III £225
- HP IID & IIID £227

Various Add-Ons

- HP Adobe costscript + Cartridge £359
- HP Premier Font Collection £28
- Laserjet various Font cartridges from £45
- Canon LBP-4 Lower Cassette Tray £96
- HPIIP/IIIP Lower Cassette Tray £96
- HP Postscript Module for LJ4 £270
- Laserjet 4 Powered envelope feeder £199
- Ethernet Card for Laserjet 4 £359
- LP4 500 Sheet paper cassette 3rd Bin £205

Fujitsu Printers

- B-100 InkJet – HP Deskjet compatible 300dpi, whisper-quiet & 6 resident fonts #£159
- B-200 InkJet – HP Desk Jet compatible 300dpi. Built in Cut Sheet Feeder. Optional 2nd Bin/Tractor available #£239
- DL-1150 Dot Matrix – 24 pin, 110 column Colour optional £209
- DL-1150colour Dot Matrix – 24 pin, 110 column With colour option £235
- DL1250 £344
- DL4600 £799
- DL5800 £999
- DL3600 £439
- DL1250colour £344
- Joywriter £249
- B-100 Cut Sheet Feeder £65
- B-200 2nd Bin Sheet Feeder £95
- B-200 Tractor Unit £65
- B-100/200 Ink Cartridges £14
- DL-1100 Colour Upgrade £39
- DL-1100 Ribbons Black £5 Colour £11
- VM 800 Toner Cartridge (8000 pgs) £105

Hewlett-Packard Printers

DeskJet 500	£255
DJ550 colour	£459
QuietJet plus	£399
DJ Portable	£283
DJ500 colour	£355
Desk Jet 510	£265
Desk Jet 1200C	£1085
Paint Jet	£495
PaintJet XL300	£1779

3 years on-site maintenance available as follows:

DeskJet & DeskWriter mono	£55
DeskJet & DeskWriter colour	£65

- Paintjet Cartridges Black £15, Colour £23
- DJ Portable CSF £49, Carrying Case £49

Desk Jet 500 Accessories

- 256K RAM Cartridge £69
- Epson FX Emulation Cart. (500 mono); £45
- Ink Cartridges Black £14; Colour £23
- High Capacity Black Ink Cartridge £21
- Black Ink refill Double Pack £9
- DJ500 Colour Archimedes Printer Driver £15
- Dust Cover £6
- DJ500C/550C Archi Printer Driver £15
- 636G 50 x Transparencies A4 £40
- 636J 50 x Glossy Paper A4 (also XL) £40
- 630Z 50 x Cut Sheet Paper A4 £15

HP Paintjet/XL Accessories

- **630P** 200 Z-Fold paper 8.5 x 11 £14
- **630Q** 50 Transparencies 8.5 x 11 £39
- **630S** 50 Transparencies A4 £40
- **630Y** 200 Cut Sheets 8.5 x 11 £14
- **631Y** 200 Cut Sheets A4 £18

Plug In Font Cartridges for DJ 500

- 22706B – Prestige, Elite, Line Draw fonts £55
- 22706C Letter Gothic & HP Line Draw fonts £56
- 22707P – Proprint Emulation Cartridge £57
- Desk Jet Unlimited (Book No VAT) £19.75

Canon Bubblejet Printers

	Printer	CSF	2nd Bin	Ink Cart
BJ10EX	£162	£43	–	£16
BJ10SX	£175	£43	–	£16
BJ200	£274	–	–	£16
BJ300*	£335	£88	£88	£12
BJ330*	£373	£110	£79	£12
BJC800C	£1345	–	–	£16

* Includes 12 months On-site warranty

- Spare Battery pack for BJ10E £33
- BJ10EX & BJ20 Turbo Driver £42
- BJC800 Archi Turbo Driver £89

Roland Plotters

- DXY1100 £499
- DXY1200 £649
- DXY1300 £869
- Sketchmate A4 £308
- Sketchmate A3 £475
- HP7440 £665
- HP7475 £899
- HP7570 £2015
- HP7575 £2529
- Roland plotter Pens, Fibre tip £7.50

Epson Printers

	Printer	CSF	Ribbon
EX1000C	£428	£–	£6
FX870	£273	£47	£4
FX1170	£339	£69	£6
LQ100	£148	£–	£4
LQ570+	£205	£47	£4
LQ870	£359	£47	£6
LQ1060	£585	£155	£6
LQ1070	£310	£69	£6
LQ1170	£434	£69	£6
LQ2550	£673	£360	£6
LX100	£116	£–	£4
LX400	£94	£69	£4
LX850+	£135	£69	£4
LX1050	£203	£125	£6
SQ870	£409	£59	£23
SQ1170	£560	£155	£23
SQ2550	£669	£–	£23
Stylus 800	£244	£–	£10

RS232 Interface Standard	£28
+8K Buffer	£75
Tractor Feed for: LQ100	£29
FX850/LQ800/850	£69
FX/LQ1050	£85
LQ2500/2550	£90

- Dustcovers for Epson 80 col printers £6

Accessories

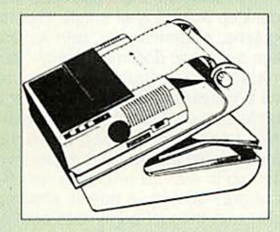
- EX800/1000 Colour Option £45
- EX800/1000 Colour Ribbon £14
- Multifont Card for LQ550/850/1050 £95

Listing Paper (Perforated)

- 1,000 Sheets 9.5" x 11" Fanfold Paper £7
- 2,000 Sheets 9.5" x 11" Fanfold Paper £11
- 1,000 Sheets 9.5" x 11" NCR 2 Part Fanfold £21
- 1,000 Sheets 15" x 11" Fanfold Paper £9
- 2,000 Sheets 15" x 11" Fanfold Paper £16
- 1,000 Sheets true A4 Fanfold Paper 70gms £11
- 2,000 Sheets true A4 Fanfold Paper 70gms £21
- 500 Sheets A4 80gms Bond £3.50

(All our Fanfold paper is Micro perforated leaving a smooth clean edge when the tractor feed strips are detached).

Professional Printer Stand



The professional printer stand takes hardly more space than your printer. Due to the positioning of the paper feed and re-fold compartments ie. one above the other, the desk space required for your printer functions is effectively halved. Its ergonomic design ensures smooth paper flow and automatic refolding.

80 Column version £19
132 Column version £29

Printer Labels

(On continuous fanfold backing sheet)

1,000 off, 90 x 36mm (Single Row)	£6.00
1,000 off, 90 x 36mm (Twin Row)	£6.25
1,000 off, 90 x 49mm (Twin Row)	£7.50
1,000 off, 102 x 36mm (Twin Row)	£6.75

Laser Printer Labels on A4 Sheets

3750 off, 70 x 29mm (3 Rows x 10)	£15.50
2400 off, 70 x 37mm (3 Rows x 8)	£15.25

Printer Ribbons & Various Dust Covers

Type	Ribbons	Dust Covers
BBC B/BBC Master	–	£4.00
Archimedes Micro pair	–	£9.00
Citizen 120D	£3.25	£5.00
EX800/1000	£6.00	£6.00
RX/FX80/85/800/MX80	£2.95	–
FX/MX/RX100/1000	£3.95	–
Kaga/Taxan KP810/815	£3.25	£5.00
LQ400/500/550/800/850	£5.50	£6.00
LQ1050/LQ2500	£12.00	£6.00
LX400/800/850	£3.50	£6.00
M1009/GLP	£2.95	£6.00
NEC P2200	£4.50	£6.00

Dust covers for most 80 column printers available at £6 each

Universal Printer Sharers/Changer

Connect up to 5 Micros to 1 printer or 5 printers to 1 Micro with our combined, Sharer/Changer switch boxes.

Standard Low Cost Type

Connects	Serial	Parallel
2 to 1	£10	£10
3 to 1	£14	£15
4 to 1	£19	£20

Professional Type

Connects	Serial	Parallel
2 to 1	£15	£16
3 to 1	£20	£23
4 to 1	£30	£34

Cables from £5 each (see cable section)

Cross Over Manual Switch

2 In/2 Out Parallel	£29
2 In/2 Out Serial	£28
3 In/2 Out Serial	£36

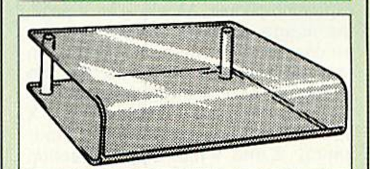
Auto Printer Sharer

Connects	Serial	Parallel
2 to 1	£34	£36
4 to 1	£52	£53
8 to 1	–	£85

Compact Converter Units

Serial to Parallel	£32
Parallel to Serial	£32

Perspex Printer Stand



Give your Computer System a touch of Class with our elegant, smoke finished Perspex Printer stand.

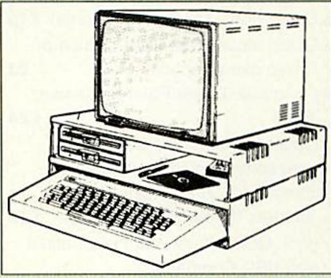
80 Column version £16 (carr £3)
136 Column version £20 (carr £4)

256k Multi Spooler

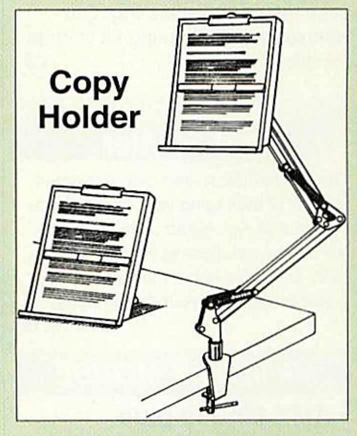
These Auto Parallel Printer Sharers have built-in 256K of Printer Buffers. They can be used as Auto Sharers, Printer Buffers or both.

- 2 In/2 out **£125**
- 4 In/2 out **£139**
- 8 In/1 out **£185**

Plinths for the BBC Master and A3000



- Single Master Plinth 490 x 310 x 105mm £14
- Double Master Plinth 490 x 310 x 210mm £26
- A3000 Single Plinth (very sturdy & precision made), has a slot on the left for the switch & cut out on the right for 3.5" Disc Drive £15



Available in 2 full A4 versions, desk resting and shelf clamping. Paper is held firmly be means of a plastic retaining ruler and a clip grip.

Desk Top **£8**
Angle poise **£12**



Copy holders as above but with a battery operated, remote controlled cursor/ruler. (By hand or foot pedal.) (Batteries 2 x AA not included.)

Desk Top **£15**
Angle poise **£20**

Servisol Foam Cleaner

This king size multipurpose foam cleaner spray is ideal for cleaning Keyboard, Monitor, Disc Drive & Computer furniture surfaces.

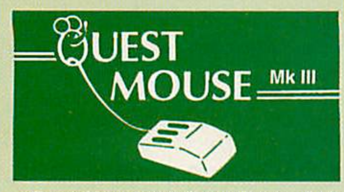
£2.50

Antistatic Aerosol Spray

Ideal for cleaning and preventing static build-up on TV/Monitor Screens.

£2.50

Continued→ → → → → →



- Quest Mouse III & Quest Paint £49
- Quest Mouse III, Quest Paint, AMX Stop Press & Pagefont £69
- Quest Mouse III only £25
- Quest Paint Software only £28
- Quest Font Disc (22 Text Fonts) £15
- Quest Mouse Mat (Red or Blue or Green please specify) £3
- Conquest (Quest Paint Extension) ROM £24
- Quest Colour Dump Disc – This new software allows you to print direct from Quest Paint to your Integrex Colour Printer £18
  (P.S. Quest Paint is not compatible with BBC Compact)

Quest Paint is the winner of the BBC Acorn User 1990 Award for the Best Art/Graphics software

Mouse Cleaning Kit

To obtain trouble free operation and prolong the life of your mouse, the high tech rodent requires regular cleaning. Our deluxe mouse cleaning kit is ideal for the purpose £3

Archi Mouse Port Splitter

Our handy little splitter unit eliminates the risk of damaging your micro due to constant plugging and unplugging of the mouse by allowing you to connect both, a joystick and a mouse simultaneously to your Archimedes. £15

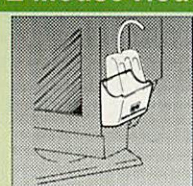
Mk III AMX MOUSE

- **AMX Mouse plus Super Art £49**

(Please specify for BBC, Master or Compact)

- AMX MOUSE ONLY £25
- AMX SUPERART Package £24
- AMX STOP PRESS – A Desktop publishing software. Works with Keyboard, Joystick or a mouse £20
- PAGE-FONTS – Over 20 Fonts for use with AMX Pagemaker £13
- AMX DESIGN (ROM) £29
- AMX EXTRA EXTRA £16
- MOUSE MAT £3

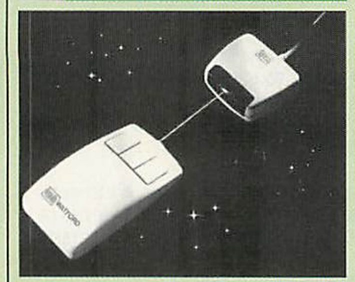
WE Mouse House



Treat your mouse to a cosy Mouse House. This handy little gadget solves the problem of where to store your mouse when it is having a rest. Made of sturdy plastic, the WE Mouse House attaches to the side of your computer, monitor, disc drive etc.

Only £3

Archi Cordless Mouse

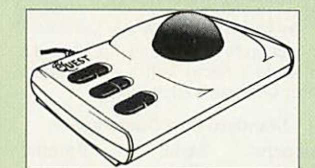


Features
- Infra Red Signal Transmission
- High Resolution 200 DPI
- High Tracking Speed of 600mm/s up
- Anti-static Silicon Rubber Coated Ball
- Low Friction Teflon Footpads
- Power - by two AAA size batteries (not included)
- Automatic Standby Mode after 5 minutes inactive
- Auto Power Shut-Down after 20 minutes inactive

Price £32

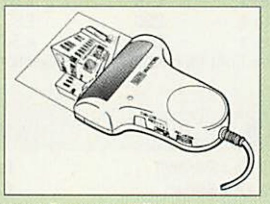
Quest – Tracer ball

An attractively finished, extremely reliable, mouse replacement, input device. Requires very little desk space. Connects directly to your BBC B, BBC Master or Archimedes Micro.



QT-10 BBC/Master Version £25
QT-20 Archimedes Version £26

Beeb Hand Scanner



Watford Beeb HandScan is a compact unit which will allow photographs, diagrams, or any other documents to be digitised quickly and easily, to then be used in a desk top publishing package, art program, or even in your own Basic programs!

Beeb HandScan & Firmware £99

Archi Mk II Hand Scanner

Watford's Mk II hand scanner has a maximum resolution of 400 dpi. The scanning width is 4". The sophisticated software is supplied in a 64K ROM, located on a standard single width expansion podule. As you scan a page, the image appears in the scanning window on the screen, scrolling up in real time. Other facilities include Cropping and scaling to any size including stretching and squashing in X and Y directions separately. Colour tinting. X and Y flip. Edge detection which turns solid objects into outlines. Images can be printed on any printer supported by RISC OS.
On-screen help is provided via the RiscOS interactive help facility. (Please write in for full technical details).

AHS-4 Archi 300/400 Version £109
AHS-3 Archi A3000 Version £119

Award winning Wapping Editor

The Wapping Editor from Watford Electronics represents a breakthrough in Desktop Publishing for the Beeb. The package includes a 64K ROM containing ALL the software needed to get into print fast; a very sophisticated graphics module, professional quality typesetting software, a word processor, a comprehensive font editor for designing your own typefaces, and a variety of printer dumps. This mouse-driven system is designed for the BBC B, the B+ and Master computers and will take full advantage of any Sideways and Shadow RAM that may be fitted. It will run under DFS, ADFS and Network filing systems and requires as a minimum just a single 40 track drive.

Wapping Editor Software Pack £49
Wapping Editor plus Mouse £69

(Wapping Editor only works with Master Compact if a Mertec Expansion box is fitted)

Wapping Art Disc

Over 250K of clip art to cut and paste into your Wapping Editor pages. Pictures include maps, transport, people, media, sport, games etc. Two 'ratio' screens for use with hi-res and rotated A5 pages to ensure images are not distorted when printed out. **£15**

Wapping Font Disc 1

Sixteen additional fonts, including smaller version of Oberon and Daisy and two new sizes of the standard font for the Wapping editor.
Also included are two Mode 0 screens containing giant 'headline' fonts to cut and paste to create extra smooth headlines.
Supplied complete with instructions. **£12**

Wapping Font Disc 2

This new addition to our Wapping range of DTP software provides you with additional 23 fonts for the Wapping Editor DTP pack. (80 track discs only). **£13**

Archi A4 Scanner



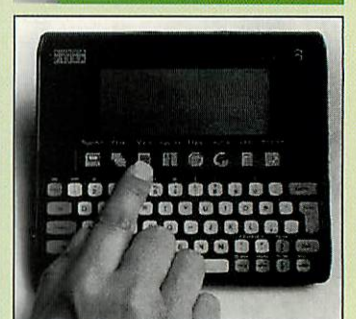
The 216mm scanning width can cope with both desktop scanning of single sheets, photographs, diagrams, etc., with its fast ten page automatic document feeder, but it can also detach from the feeder to become a convenient hand-held full page scanner for larger documents or pictures. Scanned image control can be freely adjusted in increments of 10 dots per inch from 100 up to 400 dpi resolution with 64 levels of grey scaling. A built in shading controller and manual brightness control achieve optimum image clarity.
Unlike some scanners, which use a red light source, the Watford scanner uses a yellow/green source which vastly improves the light/dark contrast, thus eliminating the effect where any red-based colours are faded down to white and so do not show up in the scanned image.

Archi A4 Scanner	£239
Sheet Feeder for above	£75
Scanner + Sheet Feeder	£309

Z88 Portable Micro

- Z88 Portable Micro £POA
- 32K RAM Pack or 32K EPROM Pack £16
- 128K RAM Pack or 128K EPROM Pack £32
- 512K RAM Pack £86
- 256K Eprom Pack £55
- Z88 Eprom Eraser Unit £38
- Z88 Carrying Case £8
- AA Nicad Rechargeable Battery £1.50
- Battery Charger Compact & Fast £6
- Z88 Serial Printer Cable £8
- Z88 Parallel Printer Cable £18
- Z88 to BBC Link £8
- Z BASE £49
- Z88 to PC Link II £27
- Z88 to Macintosh £32
- Z88 Mains Adaptor £9
- Z88 Modem £99

Psion Series III



Psion Series III Computer
- Series 3 128K £155
- Series 3 256K £179

RAM Solid State Discs (SSD)
- 128K £68
- 512K £170
- 1Mb £255

Flash Solid State Disc (SSD)
- 128K £34
- 256K £59
- 512K £102
- 1Mb £170
- 2Mb £255

Communications
- Parallel Interface Link £25
- RS 232 Serial Link for PC £58
- RS 232 Serial Link for Mac £59

Various
- Mains Adaptor 9V AC £12
- Spreadsheet £59
- Professional Finance £42
- Spelling Checker/Thesaurus £42

HP Palmtop PC

- HP95LX 512K Palmtop PC £199

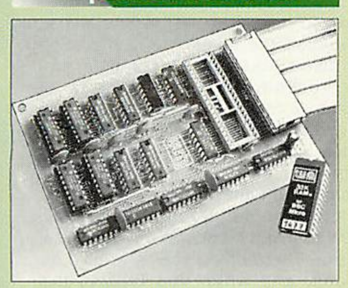
P.S. Above price includes Lotus 123, Desk Diary and Memo softwares in ROM

- HP Connectivity Pack £55
- HP95LX 512K RAM Upgrade £POA

Fax Machines

Brother 305#	£335
Brother 450#	£375
Brother 550M#	£455
Canon 170	£520
Pana UF121	£320
Pana UF128M	£415
KX F2090BE	£488
Tosh TF132	£349

32K Shadow RAM/ Printer Buffer Card Expansion Board



A MUST FOR WORD PROCESSING

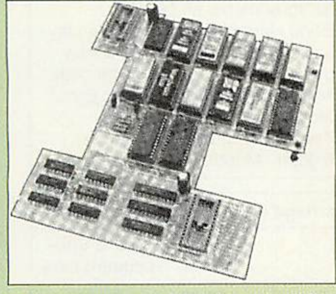
Simply plug the ribbon cable plug into the 6502 socket and gain a massive 32K of extra RAM.

- "VIEW" Wordprocessor users can now type in letters in 80 columns and have up to 28K bytes free – 5 times as much as normal.

- In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24k of text in memory. This product is recommended as an ideal complement by Computer Concepts.

Only £49

Solderless Sideways ROM Socket Board



- Increases your BBC Micro's ROM capacity from 4 to 16.
- **No soldering required.**
- Socket 14 takes two 6264 RAM chips.
- Read protect to make RAM "Vanish" allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

Price: Only £32

Battery Backup fitted **£35**

Battery Backup only **£3**

16K Sideways RAM **£8**

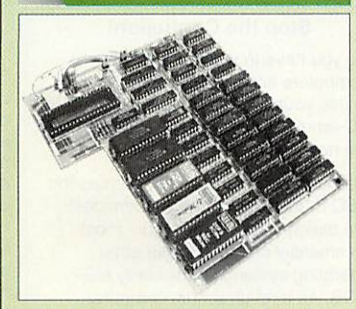
- Sideways RAM Utilities Disc for Solderless ROM Board. Includes the options to load and save ROM Images and the facility to use Sideways RAM as Printer Buffer. **Only: £8**

Watford DATA DUCK

Convert two single Disc Drives into one Dual Drive with this simple external unit (Suitable for Disc Drives with PSU. For Disc Drives without PSU, you will also require Watford Power Duck, see below). **£14**

Watford POWER DUCK £8

ROM/RAM Card



- No Soldering required to fit the board.
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- Total number of ROMs increased from 4 to 8.
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PRICES:

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OPTIONAL EXTRAS:

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- 16k DRAM for Upgrade **£13**
- Battery backup **£3**
- Read and Write protect switches **£2 each**

Complete ROM-RAM card with all options fitted **£99**

ROM Cartridges for the BBC Master

Will accept the larger Piggy Back ROMs like Interword, Quest, etc.

- Twin **£9**; • Quad **£14**

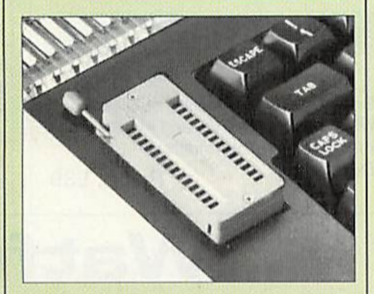






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Sideways ROM ZIF Socket System



Allows you to change your ROMs quickly and efficiently, without having to open the lid. The ZIF socket is located into the ROM Cartridge's position. It is very simple to install. No soldering required. Also included in the price is a plastic see through storage case with antistatic lining, which allows you to store 12 ROMs. **£18**

Leasing finance now available at very attractive rates to Businesses (subject to status), Education establishments, Government Depts. and Local Councils. Min. £1000. Please telephone for details.

Computer Concept's ROMS

Inter BASE	£49
Inter CHART	£25
Inter SHEET	£37
Inter WORD	£36
Mega-3 ROM	£76
Spell Master	£42
Wordwise Plus	£38#

Price includes a FREE Wordaid Rom

Word-Aid

This advance utilities ROM extends the power of your Wordwise plus ROM.

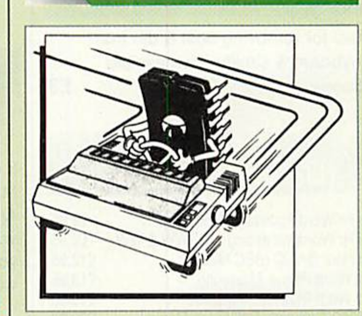
Only **£24**

(N.B. Word Aid requires a Disc interface in your Micro)

Acorn ROMS

View 3.0 ROM	**£45**
Viewsheet (Acornsoft)	**£36**
Viewstore	**£36**
Viewspell – 80T disc	**£25**
View-Index	**£12**

View Printer Driver ROM



View is a powerful word processor, but it seriously lacks in terms of printer driver support. With the View Printer Driver ROM, the View users will find themselves in the realms of advanced word processing.

Price: Only £29

User Port Splitter Unit



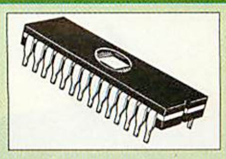
Gone are the days when you had to plug and unplug devices from the User Port. This extremely useful little device allows you to connect two devices simultaneously to the BBC's user port.

Excellent Value at **£22**



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Watford Electronics' New High Tech Computer Boutique is now open in Luton. Don't miss your chance to visit the Acorn Village.

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6502A	£5.00	74LS373	£1.00
6522	£4.00	74LS393	£1.00
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Special Offer £10

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Features:

- Direct connection to BBC Analogue input port –
- Fully compatible with all BBC Joystick controlled games programmes.
- Switchable springs allow selection of floating or centring operation.
- Trim adjusters for both X and Y axes for fine centre adjustment.
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This extremely useful tool allows you trouble free chip insertion and removal from your computer by distributing the removal force over the whole body of any 24 or 28 pin chip.

- Plastic Chip Extractor **£2**
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Over erasure of EPROMs very rapidly turns them into ROMs!
The TEX erasers operate following the manufacturers specifications to give the maximum possible working life by not erasing too fast.

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ACORN to PC

Stop the Confusion!

Do you have to use both Acorn computers and PC's? Would you like to use your Archimedes or A3000 in PC-emulation mode but are unsure of the new commands?

Although Acorn machines (such as the BBC B, the Master, the Archimedes) are mainly used in education, most commercial computers use other operating systems, particularly MS-DOS. As a result school computer users are at a disadvantage when moving into 'business' computing. PCs and other commercial computers use MS-DOS as the operating system, so commands for formatting, copying, backing up, printing and the modem are not the same. Even file names are written differently! And did you know that there is one Acorn command which, if used in MS-DOS, wipes everything in the current directory?

'ACORN TO PC' enables you to change over painlessly. It shows clearly and quickly how, why and where the two systems (Acorn and MS-DOS) differ. As with a foreign language dictionary, you can use the book to transfer either way – from Acorn to MS-DOS, or from MS-DOS to Acorn.

Price: £6.95 (No VAT)

The Complete BBC Computer User Handbook

If you own a BBC B, B+, Electron, Master 128 or Master Compact, or Archimedes, then this is the book for you. It shows how to get the best from your machine, and how to make it work for you.

Only: **£9.95** (No VAT)

Beeb PC (BASIC)

Designed for program authors to convert BBC programs to run on IBM PCs.

Price: £38

Beeb DOS 3.0

(Now reads Archimedes Discs)

Beeb DOS is a collection of utilities which run on the PCs and enable it to read and write information on BBC Discs.

Price: £39

The Epson RX/FX Printer Commands Revealed Handbook

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities – he may even have offered you a special price.
However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.
Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out? Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON FX-KAGA PRINTER COMMANDS REVEALED'.
This book describes in plain, easy to understand English, how to use and make the most of your KP810, PW1080A or any other Epson FX80 compatible printers like Panasonic KX-P1080/1, etc., with the BBC Micro, both from Basic and Wordwise.

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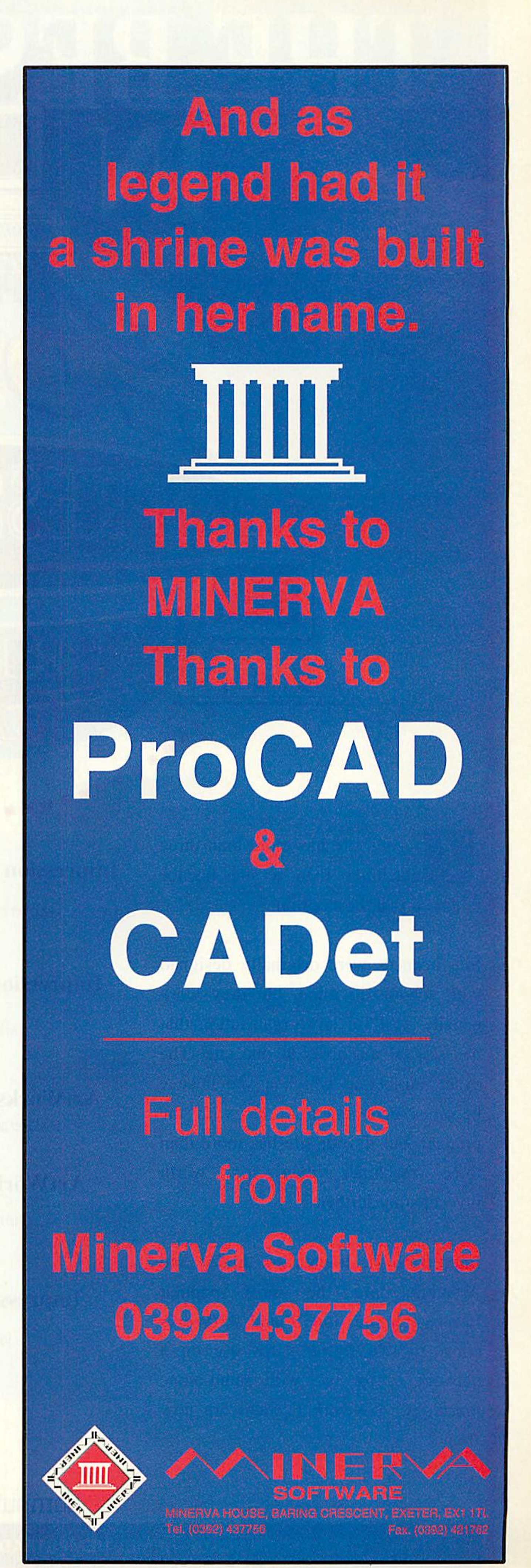
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And as legend had it a shrine was built in her name.
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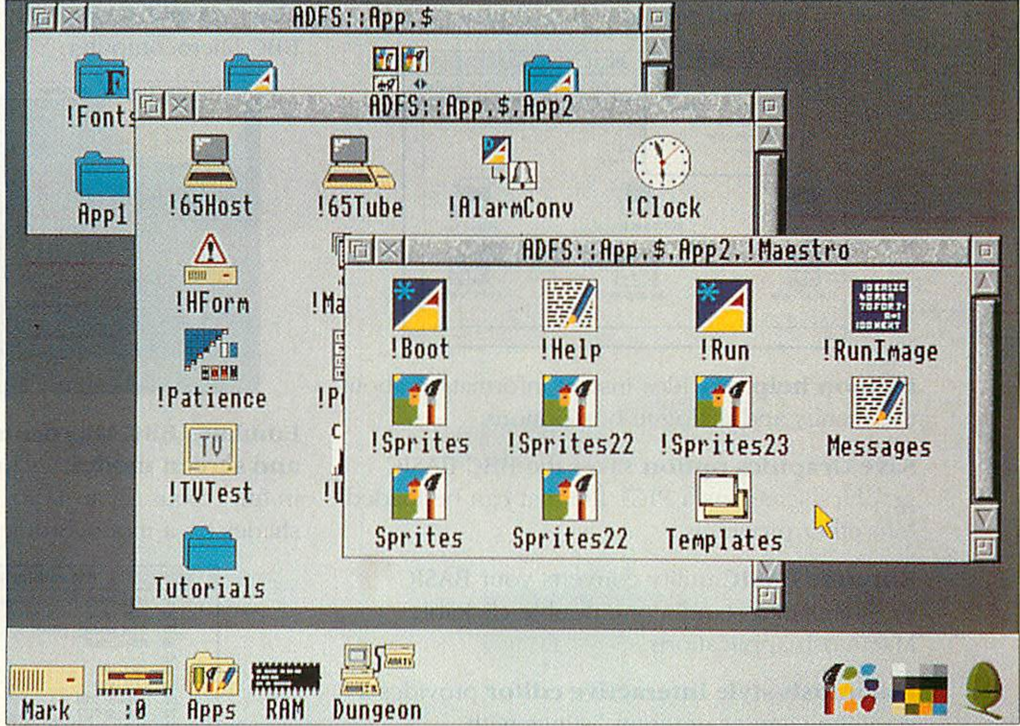
You know what your applications do, now Gavin Burns explains how they do it

ABSOLUTE BEGINNERS

It is very likely you have never wondered how an application works and the stuff of which it is made. But consider this. Without this vital addition to your knowledge, there is little chance you will ever reach Super User status. So let us take you on a tour of the inner life of your application.

As you already know, when you double-click on a directory, it is opened, allowing access to whatever it may store. If the same action is performed on an application icon, the program will actually run.

Nonetheless, an application is really a special kind of directory. It is treated differently to a normal directory and is indicated by being started with a ! character. This exclamation mark is known as a *pling* to technical people.



All the different files which go to make up Maestro

BEHIND THE ICON

To explain how an application works, take the example of *Maestro*. This application is included with Risc OS, and allows you to create your own symphonies. Its contents are typical of most applications. Hold down the SHIFT key and double-click on the *Maestro* icon. Several files appear. Some look like sailing yachts, others like *Edit* files.

The first is *!Boot*, an obey file. To see the commands it contains, load the file into *Edit*, by dragging the *!Boot* icon onto *Edit* on the iconbar at the bottom of the screen. An extremely important file this, as anyone who read last month's Absolute Beginners will know. *!Boot* files are basically bossy and set everything up. In the case of *Maestro*, it loads the application sprite into memory and sets up things like file types, so the computer knows what to do when you run a *Maestro* file.

If you get stuck and desperately require extra guidance while using any application, *!Help* is at hand. This is a text-file containing instructions for the application. It's inefficient to access *!Help* each time by pressing SHIFT and double-clicking to request the file, so hold the menu button over the *!Maestro* application icon and a number of options will appear; one of these is *Help* but without the pling.

!Run is another important obey file. It is run whenever you double-click on the application icon, and it sets up the necessary amount of memory required for the application to run. It loads and checks relevant modules before actually running the main program.

The program itself is in *!RunImage*. *Maestro* is written in Basic, the easiest programming language. (The more advanced among you will know of other programming languages like C; other applications may be programmed in these, rather than Basic.)

The next three files are sprite files. *!Sprites*, *!Sprites22* and *!Sprites23* contain files which dictate how the application icon looks in a directory. Loaded by *!Boot*, each file is for a different mode.

!Sprites is for low-resolution monitors, *!Sprites22* for high-resolution mono screens and *!Sprites23* is suitable for high-resolution colour monitors. Your computer is configured to know what monitor it is attached to and will automatically load the appropriate sprite file.

If you decide to meddle with an application, to change it to run in French say, alter the text file *Messages*. Look at its contents by loading it into *Edit*. You can see that this file contains all the instructions and words that appear in the application. It's very easy to alter any of these lines: delete what you don't want and replace it with what you do. The application will read these messages and *Maestro* will appear in the language you have specified until you change it again. But make sure you have a working backup copy of your applications, before ad-libbing in the message file.

Another two sprite files follow, *Sprites* and *Sprites22*. All the pictures and musical notation that appear and are used in the *Maestro* windows are stored here – crochets, quavers, bass clef, treble clef and so on. To see the sprites, load them into *Paint*.

The size and shape of windows is defined in the templates file. If you have *FormEd*, a template editor which comes with both Acorn's C and Assembly compilers, edit the windows to your own tastes. If not, you'll just have to put up with them as they are.

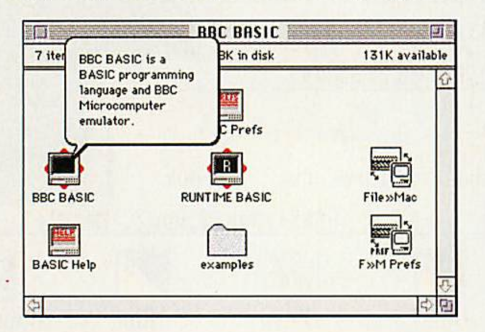
This theory works for other applications as well, but they are all slightly different. Why not try out a few of your own?

BBC BASIC Version 3

Programming language and Emulator for the Apple™ Macintosh™

Combines the power of the Macintosh ...

BBC BASIC 3 takes advantage of the advanced features of the Macintosh, and System 7, to provide an ideal environment in which to develop, test, and run your BASIC programs.

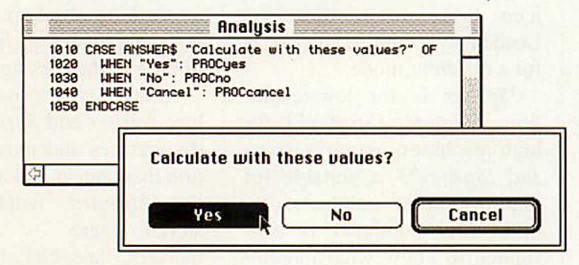


Balloon help provides instant information about the menus and dialogue-box options.

Save Graphics option saves the BBC BASIC graphics screen as a PICT file that can be loaded into other programs.

Runtime BASIC utility converts your BASIC programs into stand-alone double-clickable Macintosh applications.

Macintosh-style interactive editor provides a scrolling view of program listings with convenient cursor or mouse editing. You can work with any font available on your system and you can display keywords highlighted in bold for easy reference.



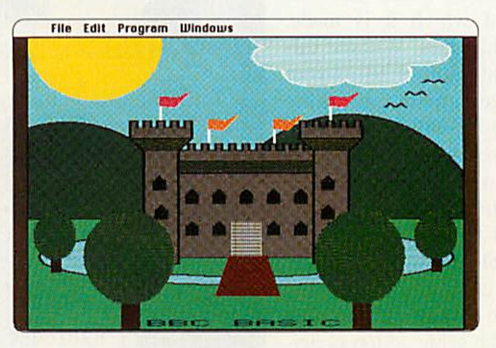
Macintosh Toolbox interface allows you to define your own menus, dialogue boxes, and scrolling lists using convenient BASIC keywords, and use the standard file dialogues for opening and saving data files.

Dynamic tracing and debugging lets you run or step through a program, highlighting each statement as it is executed, and you can display the values of any variables or expressions.

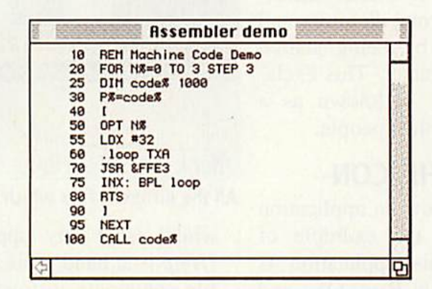
Comprehensive help system gives you instant information on keywords and operators, without interrupting what you are doing.

...with the best of the BBC Microcomputer:

BBC BASIC for the Macintosh gives you access to the foremost educational programming language in the UK, with the ability to run many programs originally developed for the BBC Microcomputer.



Emulates BBC Microcomputer graphics and screen modes, including Teletext. Work in full colour on an LC or Macintosh II, or grey shades on a monochrome Macintosh.



Built-in assembler and 6502 machine-code interpreter allows you to compile and run 6502 assembler programs, or machine code which you have loaded in directly.

Full emulation of the BBC Microcomputer Operating System including all the standard system calls and vectors, OSBYTE, OSWORD, *FX calls, VDU codes, function keys, sound, and DFS/ADFS commands.

Includes File»Mac transfer utility to transfer programs and data files to or from an Acorn Archimedes or BBC Microcomputer.

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BACK TO NATURE

Scenes and sounds from nature provide a perfect subject for CD-Rom. Clare Johnson looks at three classroom choices

There are a number of CD-Roms appearing on the market claiming to fulfill tricky areas of the National Curriculum. This month we take a look at three packages. These tackle the areas of plants, animals and birds, respectively.

CREEPY CRAWLIES

Supplier: Media Design Interactive
Tel: (0252) 714340
Price: £99

The *Creepy Crawlies* CD-Rom contains numerous creatures under headings such as Wet Stuff, Killers and Strange Habits. These names and others appear as the front menu and, apart from an alphabetically-arranged index, this appears to be the only way to search the database.

Each card has a still photo, a video sequence and the text. This text can be preset into English or French and harder or easier language content can be selected. Each card also has a spoken narrative describing the creepy crawly, but this doesn't match the written text so it can't be used to encourage reading.

The card also contains the family tree of each creepy crawly, giving full biological classification of the animal. I would like to be able to search more fully but its contents are fascinating and the video sequences are very good.

BRITISH BIRDS

Supplier: Interactive Learning Productions
Tel: 091-261 1255
Price: £125

This CD-Rom, produced in conjunction with the RSPB and the British Library, includes all-year-round residents, winter and summer visitors and occasional callers.

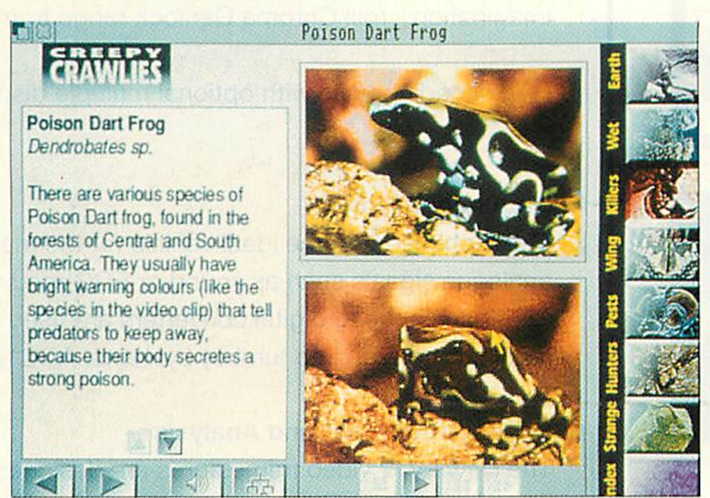
The nicest touch is the tutorial on disc, which shows how to put together a complex search. Each bird is classified by name, group, length, habitat, colour and residency. There is a map for each bird's breeding area, extensive text, sound recordings of calls, and song and video clips.

The photos can be viewed in close-up, giving young users the chance to look at feet and beaks in real detail. The text also contains certain keywords written in red and hyperlinked to other cards, giving explanations of their meanings and other details.

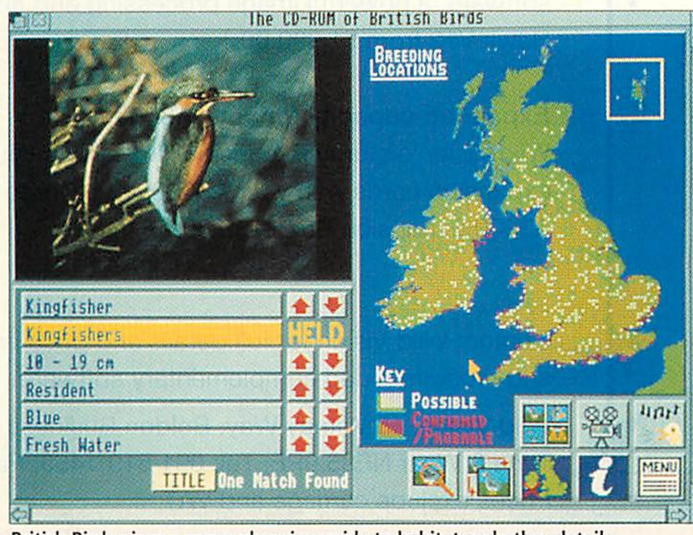
There is also a quiz, accessible at any point from the database so pupils can test themselves on what they have learnt.



Woodlands offers a comprehensive approach



Creepy Crawlies looks at Wet Stuff and Killers



British Birds gives a comprehensive guide to habitat and other details

WOODLAND

Supplier: APA Multimedia
Tel: (0634) 295222
Price: £150

The contents of this CD-Rom are not difficult to predict. A large number of animals, birds, butterflies, creepy crawlies, plants, flowers and fungi are catalogued alongside sounds, facts, figures, and habitats.

The information is easy to read, but beware opening too many windows: you soon run out of memory. The sound recordings were excellent.

The database has 'supersearch', allowing users to combine up to three criteria in one search, giving a list of results for you to choose from.

There is an application called *Bookmark* which allows a user to mark resources by type and size and save them to disc. Perhaps the most interesting feature is that this CD-Rom can be effectively-used on a network.

CONCLUSION

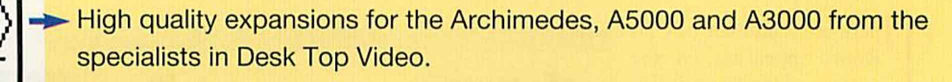
All three discs cover ground well-documented in other media forms. The *British Birds* disc give by far the most comprehensive data and support material but all three would have value in areas of Science and Environmental Studies.

DESKTOP VIDEO

ON THE MENU TODAY...

Wild Vision

Info



High quality expansions for the Archimedes, A5000 and A3000 from the specialists in Desk Top Video.



Real Time Colour Video Digitisers

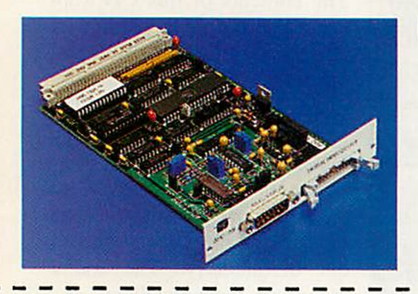
Use video or TV as a source for computer images. The popular Hawk V9 digitiser is the ideal solution wherever you need photograph-like sprites in colour or monochrome for DTP or Art applications. Wild Vision combine quality and performance with value; real-time colour digitisers available from £199.00.



Superimposing text, graphics or animation onto video

Simple, with a *genlock and overlay card*. The Chroma range is your route to creating and recording video masterpieces. Just let the film - and your imagination - roll! Chroma Genlock range from £215.00.

PAL encoding units with optional multiple display facility also available.



Data acquisition

The Archimedes is the ideal vehicle for the measurement and analysis of analogue signals such as sound or ECG readings. Wild Vision's high speed 12-bit analogue to digital converters are used in medicine, research, defence, and incorporated into turnkey systems. ADC1208 from £560.00.

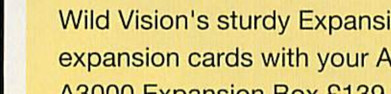
Image Processing

Image Processing and Analysis

The Hawk V12 video framestores are designed specifically for image processing on the mighty Archimedes. With Foster Findlay's ArcImage software, a powerful image processing and analysis system is created. Hawk V12 from £1,990.00.

A3000 Expansion

Expanded capacity for your A3000



Wild Vision's sturdy Expansion Box allows you to use standard Archimedes expansion cards with your A3000; up to three cards may be fitted at once. A3000 Expansion Box £139.00.

Misc

Contact Wild Vision for full details and price information on the above hardware and recommended complementary software.

Quit

Wild Vision, 15 Witney Way, Boldon Business Park, Boldon Colliery, Tyne & Wear NE35 9PE, Tel: 091 519 1455, Fax: 091 519 1929

Prices exclude carriage and VAT

WILD VISION

GET YOURSELF ORGANISED

Inputting data is easy, recovering it is another matter. Ian Burley looks at one answer: Clares' Knowledge Organiser 2

The user guide for Knowledge Organiser points out that humanity's well of knowledge, most of which exists in text form, now doubles in volume every five years. Clares' Knowledge Organiser 2 is designed to tackle this problem in a flexible and context-sensitive manner.

Clares first brought this unusual, free-form, textual database system to the Archimedes market five years ago. Unfortunately, KO mark 1 was only for the dedicated few. It wasn't Risc OS-compliant and its user interface was tricky to master. Clares has addressed these criticisms and has employed Icelandic programmer Höskuldur Hermannsson to remould the original, quirky KO into a genuine, full-blooded Risc OS application.

KO2 is a complete rewrite. The package labels and indexes chunks of text, so stored information can be searched using codewords or mnemonics relating to specific topics. Original KO files can be translated into KO2 format.

Everything revolves around Subject files. These contain the text data to be searched plus search codes and an index. Each text item has a collection of context and source codes associated with it. Context codes are created by the user in mnemonic form. If your Subject file contains several items relating to desktop publishing the context code could be DTP. If it relates to Clares Micro Supplies products you might use CMS. Generally, context codes are kept to five characters or less.

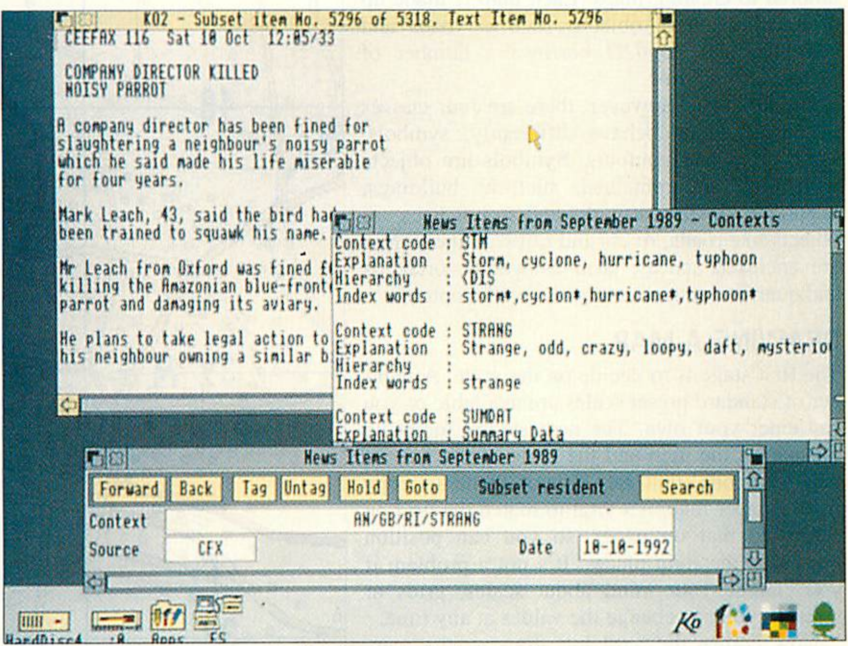
A full list of context codes relating to passages in each Subject file can be displayed. There is also space for a short definition of each code, and both the code mnemonic and definition can be keyword-searched. This is important because a complex Subject file could have dozens, even hundreds of context codes. The same list can show any hierarchical relationship with other context codes: koalas within marsupials within mammals, for example.

There is also a list of source codes which can be updated to indicate where a particular text passage was obtained, who the author was, and so on. So, if I had written the piece, the code could be IFB, including my middle initial. Like context codes, source codes can be searched. So, I could look back on all the articles I had written on desktop publishing, using the DTP context code, then the IFB source code.

Central to KO's operation is the Linker. Each text passage in a Subject file has a Linker card, which always features context and source code data. More fields can be added and defined by the user. It's through the Linker window that complex searches involving a selection of codes can be set up.

Although this type of database does not require strictly-defined templates, a fair amount of work is involved in planning and creating a Subject file.

You need to evaluate the incoming data, invent meaningful mnemonics for the codes and ensure they all have precise descriptions. This may sound simple, but the actual process is quite complex. Text passages can be sourced from almost anywhere, from word processor documents to CD-Roms – even videotext or teletext frames. It's especially suitable for the latter, as news items, for example, come in neat, bite-sized chunks.



A steep learning curve is rewarded with a great deal of search power

KO2's potential is clearly displayed by a sample Subject file which covers a wide range of humorous quotations. However, at first I felt quite intimidated by the strange collection of alien search codes and the relationships between them. KO2 is much more logically presented than its predecessor but is still far from simple. Setting up your own Subject files is a labour of love; getting used to files generated by others means scaling a steep learning curve.

I am used to direct, keyword text-searching utilities, common in the PC market. The process is automatic, though depending on the algorithm, lengthy. KO2 highlights the lack of a simpler, keyword-based, file indexing application for the Arc, like WordBase on the PC.

This is an elegant package, but I can't help feeling it is a niche one. That said, I am pleased that Clares has persevered with KO2 since a well-built KO2 database gives the user a great deal of search power. Now, I wonder if its capabilities could be extended beyond plain text: a multimedia version perhaps?

PLOT ON THE LANDSCAPE

Mark Moxon charts a course through Topographer, the new package from Clares that adds an extra dimension to map-making

Computers are well-suited to map-making. Maps in computer format can easily be updated, printed, scaled and analysed, unlike their paper counterparts.

It comes as no surprise, then, that Clares has released *Topographer*, a combined two- and three-dimensional mapping package. Aimed mainly at the educational market, the package allows you to create a two-dimensional map, then to generate three-dimensional views, as if you were actually there.

TWO-DIMENSIONAL MAPPING

Topographer consists of two applications: *Topo2D* and *Topo3D*. Maps are created in *Topo2D*, and can be exported to *Topo3D* for rendering. Although the aim of the package is to create 3D scenes from maps, you'll find most of your time is spent drawing maps in *Topo2D*.

Conceptually, *Topo2D* is a bit like *Draw*, but tailored to creating maps. Each map is made up of a collection of objects, such as roads and contours, and *Topo2D* borrows a number of features from *Draw*.

Unlike *Draw*, however, there are four classes of object which behave differently: symbols, lines, areas and contours. Symbols are objects which are self-contained, such as buildings, telephone kiosks, car parks and so on; lines are objects like roads, rivers and railway lines; areas are enclosed spaces, such as woods, orchards and quarries; and, contours are, well, contours.

DRAWING A MAP

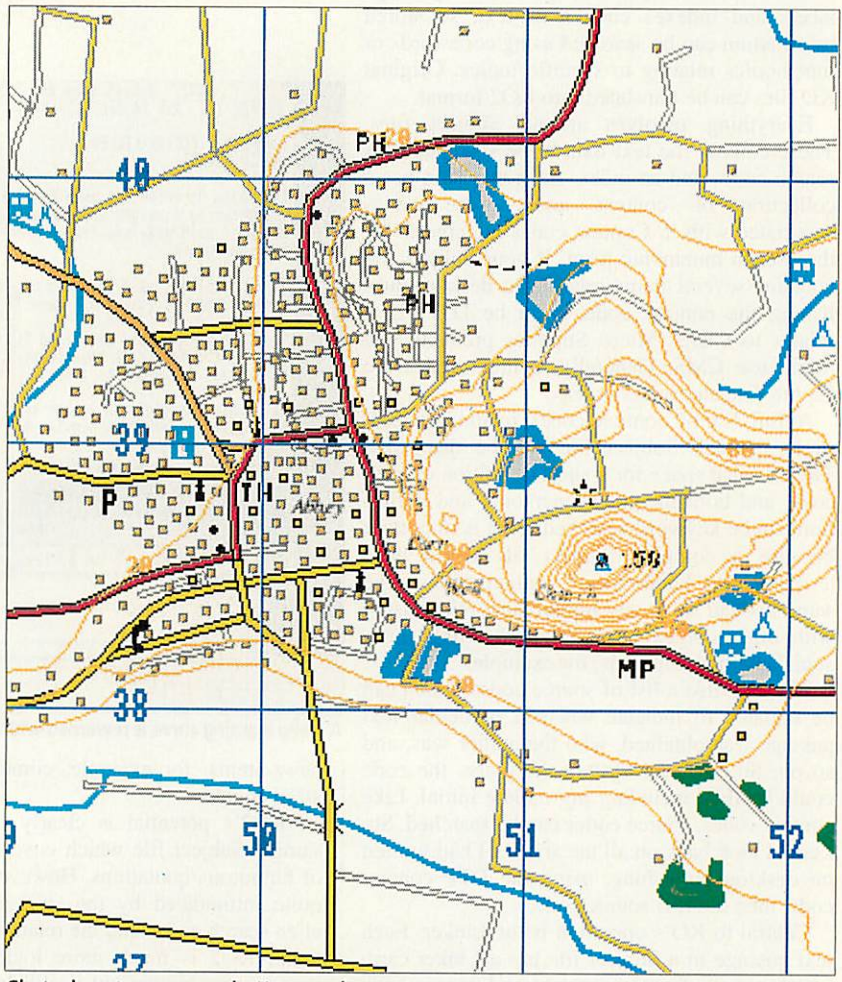
The first stage is to decide on the scale. A number of standard preset scales are available or you can enter your own. The next step is to set up the size of the map and the scale of the grid (if you want one, that is); if you intend to copy from a paper map, it's vital to match the grid on screen to that on paper, so you can position objects at the right places. It's not a problem if you change your mind about scales, grids or sizes, as you can change the values at any time.

Now comes the hard bit: drawing the map. The main tools used are the Features window, which contains icons for all the objects available, and the Co-ordinates window, which continuously shows the pointer's map reference.

Placing objects is easy. Choose the object – be it a road, post office, contour or whatever – in the Features window, then click in the Map window. The name of the symbol is shown at the bottom of the Features window: invaluable if you have a tendency to get your public houses and your post offices mixed up. There may also be a parameter which can be altered, such as the height of a building or value for a contour.

Symbols are placed straight on the map; roads are created as sequences of points joined up by straight lines; areas and contours are closed paths (so the start and end points are the same). Lines are created in a similar way to *Draw*: you click at the start, move the mouse to the next point and click, then the next point, and so on.

The last point to be entered can be removed by clicking Adjust, and holding down Adjust lets you backtrack along the line rapidly. Double-clicking finishes the path. The object is then displayed (red for major roads, yellow for minor roads, blue for rivers and so on).



Glastonbury town as seen by Topographer

This method is fine if you want very straight roads and rivers, but if you want accurate curves, it's tricky; this is where the freehand feature comes in. By holding down Select, you can move the mouse around, and a path will be created, consisting of lots of little straight lines.

For those of you with *ArtWorks*, this is similar to the freehand option in that application, except only straight line segments are created, not Bezier curves. There are also a couple of nice features which let objects fit together neatly on the map: when a road needs to go over a bridge for example. You can see this in action on the yellow road going south out of Glastonbury.

Another feature which makes maps neater is

the ability to join roads seamlessly. If, for example, you are drawing a minor road which you want to join to a major road, holding down CTRL when clicking the last point of the minor road will create a neat junction.

CHOPPING AND CHANGING

As you would expect, objects can be selected, copied, cut and moved to the front or back. The copying system uses a clipboard rather than *Draw*'s straight copying. This is an improvement, *Topographer*'s technique being more useful for editing multiple selections.

A very useful addition to the editing features is the ability to change object parameters for selected objects; you can, for example, select all the churches in your map and double their height. An interesting point is that you can alter the sizes of buildings, but their icons on the map remain a fixed size.

One annoying situation occurs when selecting objects. If you have a contour, for example, then clicking anywhere on the contour line will select it. This can cause havoc if you have a house positioned on a contour, as you can spend ages clicking over the house, only to find that the contour is selected every time.

The solution is to change the Selection Focus. This lets you decide which types of object are selected: symbols, lines, areas, contours or any combination. It also allows you to delete all objects except contours, for example, to show the shape of the landscape, or you can switch off all selection so you can't accidentally move what you have drawn.

Another feature of the Select submenu is contour replication. Drawing contours accurately is a real pain, and replication allows you to generate contours based on one example shape. This contour is automatically copied and reduced, and a user-determined value is added to (or subtracted from) the height. If you look closely at Glastonbury Tor in our example (to the south-east of the town) you see that the contours are all the same shape; I cheated a little and used replication to create the Tor.

There are a number of other features which you would expect to find. Your map can be zoomed to a percentage of its normal size; it can be saved either as a map file or as a *Draw* file (though you can't load *Draw* files back into *Topo2D*); and you can print your map via the normal printer drivers. The final option on the *Topo2D* menu is Export to 3D.

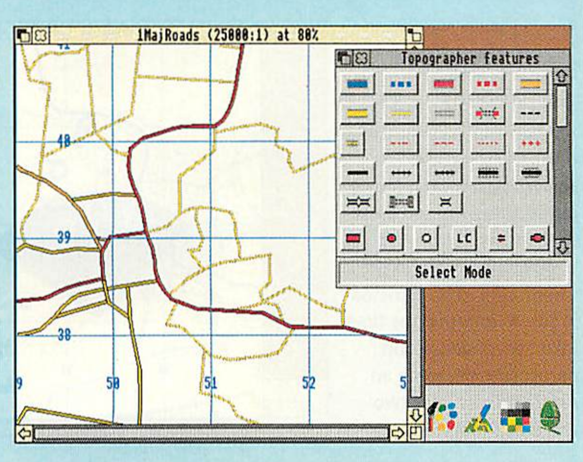
RENDERING MAPS

Topo3D is very simple to use. Loading a map file into the application displays the map in a window (which can be zoomed if required) and in this window you define the view to be rendered. A view is constructed from an arrow and a cone: the arrow determines the position and direction of your gaze, and the cone defines which area of the map should be taken into consideration – everything outside the cone is ignored. You set the viewer's height above the ground, and the line of sight, so you can obtain views taken from above the ground (as in the example scene).

Views can be stored and recalled, and are saved along with map files. Rendering views

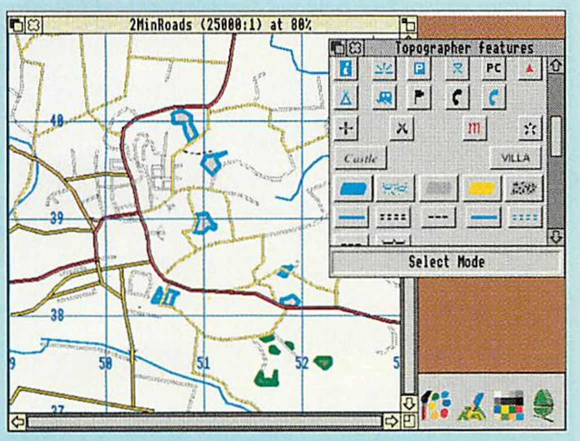
MAPPING GLASTONBURY

MAIN ROADS
To test out the application, I created a map of Glastonbury, as that area contains a number of interesting features, such as Glastonbury Tor. To start off, I drew the main roads, as these were the most obvious objects on the OS map and would help me position other objects such as minor roads, rivers and woodland in later stages. Most of the roads were drawn freehand.



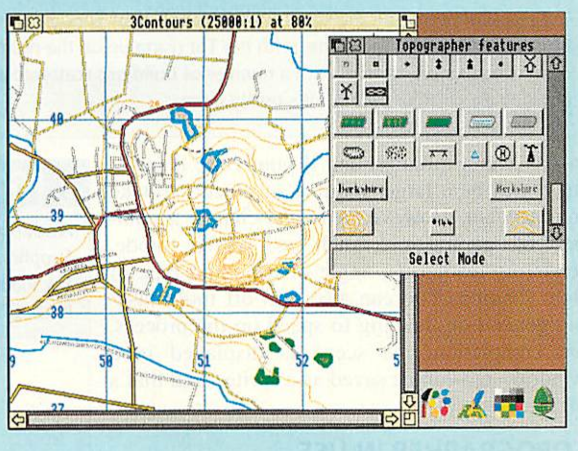
MINOR FEATURES
My next step was to add minor roads, paths, rivers, the bridge on the southbound road, orchards and woodland. You can see that the map is beginning to look fuller and more realistic.

Note that some of the smaller orchards do look like lakes, and some of the white roads in the centre of the town look a little messy because they are transparent.

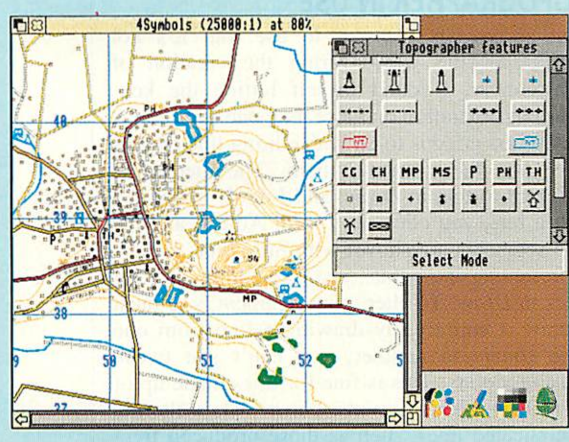


ADDING CONTOURS
I added all the contours to the map in stage three, without a doubt, the trickiest part of the operation. I drew the large contours first, then used the replication option to create Glastonbury Tor.

The Adjust Parameters tool was invaluable for checking the heights of the contours. However not all of the heights are shown on the screen because there simply isn't room.

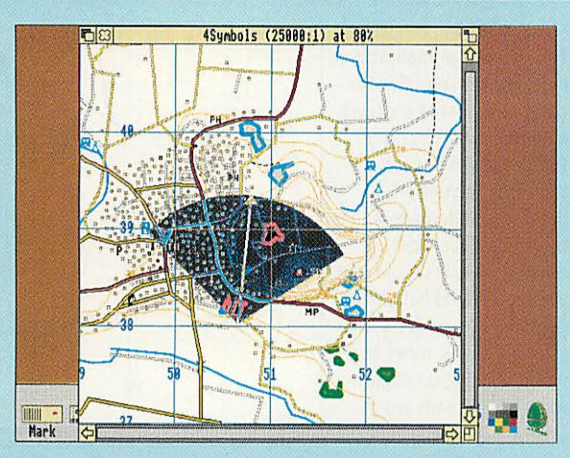


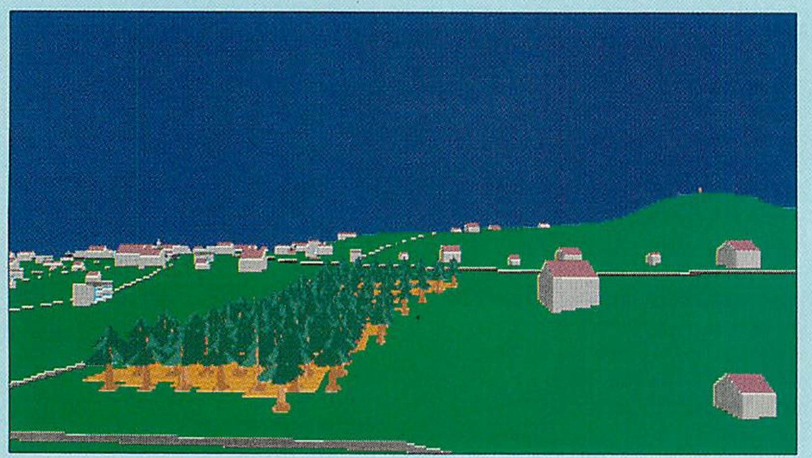
THE FINISHED MAP
The main addition is that of the buildings in Glastonbury, but other points to note are the spot height on top of the Tor; ancient lettering for the Abbey, Barn, Well and Church; various campsites, pubs, churches and a number of other symbols. That maps this complicated can be created with *Topo2D* is as good an indication of the capabilities of the software as any.



RENDERING A 3D SCENE

This is the view set up in *Topo3D*. The observer is standing south of the town and south-west of the Tor, and is looking in a northerly direction. The cone chosen for rendering includes the Tor and most of the town centre, with a large orchard right in the foreground. It is restricted in size to improve the time taken to render; in this particular case, using an Arm3 it took about two and a half minutes.





The result of rendering the view shows the power of *Topographer*. Glastonbury town lies on the left-hand side of the scene, with the Tor rising up on the right-hand side. There is the orchard in the foreground, with a number of buildings scattered around. Glastonbury may not look exactly like this, but it's pretty close.

takes several minutes, and if your cone is large, there will be a larger number of objects to take into account. However, you can change a number of parameters, such as screen mode, rendering resolution, angle of cone and type of light shading. You can also turn off multi-tasking generation, helping to speed up the process. On completion, the scene is displayed in a window, and can be saved as a sprite. And that's all there is to it.

PRODUCT DETAILS

Product: Topographer
Supplier: Clares Micro Supplies
Tel: (0606) 485111
Price: £79.95

TOPOGRAPHER IN USE

Topographer is pleasant to use, but it's not perfect all the way. During the creation of Glastonbury, I found myself hitting the keyboard in frustration on more than one occasion.

My first gripe is to do with editing line objects once you have entered them. The method is different to that in *Draw*, and I don't like it. To edit a line, you click on it with Adjust, and the line segments are shown with little blue squares representing the points, just like editing straight lines in *Draw*. To alter a line segment, you must redraw it entirely, by drawing a line from one blue square to another; you can't just tweak existing points. This is fine for lines made up of a small number of points, but it makes altering complicated lines, such as those produced freehand, nearly impossible.

Also, if you make a mistake while editing a line and you choose to abandon the edit, the entire line is deleted, not returned to the state before the edit was started. I frequently found it easier simply to redraw lines than try to edit them, and that's surely counter-productive. The whole line-editing process seems very odd to me, though Clares assures me it is an unavoidable consequence of storing curves as straight lines. If *Draw* copes, why can't *Topographer*?

Another irritant is that you cannot get the co-ordinates of points you have entered, without placing the mouse pointer over the point and looking at the Co-ordinates window. It would be useful to be able to enter points by typing in their co-ordinates, rather than having to move the mouse to an exact position and click. Copying maps from paper requires accurate positioning of objects, and that's very hard just using the mouse and the Co-ordinates window.

There are further little niggles. Minor roads, normally shown white on OS maps, are drawn as transparent. This is correct, because it means if you put a minor road through a forest, it goes green, just like on OS maps. However, when minor roads meet, the junctions look a bit messy, as you can see if you look at the minor roads in Glastonbury town centre.

Orchards are, rather strangely, shown in grey with a cyan border, rather than green. I suppose this is to distinguish them from the three types of woodland (coniferous, non-coniferous and mixed) but it means if you have a small orchard, it comes out blue: indistinguishable from a lake.

Houses are also a bit of a problem. In this version, you enter each house as a separate box, as you can see from the map of Glastonbury. This doesn't look too bad on the map, and can give a better feel for the spread of a population centre than the OS convention of marking built-up areas. When it comes to rendering a 3D scene, however, the houses look a little lonely, not giving the feel of a town at all. For Glastonbury, I had to create a large number of houses in the centre, then view it from a distance at an oblique angle to get any feeling for a centre of population. Clares hopes version two will cope with built-up areas, but that remains to be seen.

The large number of objects I had to create for the town centre also meant that the window refresh was noticeably slow, even on the Arm3. As an experiment, I turned the Arm3 cache off, and it took a good ten seconds or so to redraw the entire map; that can really grate if you drag windows around in front of your map.

CONCLUSIONS

Despite my grumbles, I liked *Topographer*. As a tool for bringing mapping alive it is unrivalled, and there is immense satisfaction to be had from creating a map of a real area and being able to visualise it in three dimensions.

The software performs very well, and is easy and intuitive to use and it's wonderful to be able to create OS maps easily, and then incorporate them in DTP packages as *Draw* files. Little things, like showing the names of the symbols in the Features window, will be invaluable in helping children get to grips with map reading. It's not hard to see how this would add spice to geography lessons.

Opening Hours Monday-Saturday 10.00 to 18.00

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!QuickShow
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Has never been easier!

The easy to use slide show presentation and video titling package. Create sequences of frames containing text of any colour with drop shadows, outline shadows and rubout boxes using the RISCOS fonts. Sprites can also be included in frames and positioned and resized as necessary. Several screens can be linked together with the sequencer which allows you to fade each screen out and in with the many fades provided. Completed sequences can be converted into stand alone applications which when run, shows the sequence without using !QuickShow. 2Mb RAM required and hard disc is recommended.

QuickSnd £10+VAT

Load, play, convert & resave existing Armadeus, Tracker and raw data sound samples and apply special effects including Reverse, Echo, Max Vol, alter replay rate and resample frequency. Convert samples into modules for use with the RISCOS sound system etc. Create stand alone Utility modules which when called, via star commands, automatically play and then remove itself completely from memory (this feature is not available on any other sound package). Use Utility sound modules with RISCOS Alarm to play on activation of an alarm. On screen VU meter included.

Acorn/Cumana Multimedia

Acorn Multimedia Expansion System — £499

Comprises A4000 style case complete with power supply, SONY multi-session CD-ROM drive, pre-amplifier with headphone/phono inputs/outputs, CD caddy, etc. The unit can also house a 3.5" SCSI hard disc and another CD-ROM drive or Magneto Optical SCSI drive.

Add £100 to above for SCSI Interface (specify for which machine)

Cumana CD-ROM Multimedia Pack — £699

Comprises CD-ROM drive, SCSI card, stereo speakers, 6 RISCOS CD-ROM titles, The Hutchinson Encyclopedia, Dictionary of the Living World, Revelation 2, The Illustrated Holy Bible, The Illustrated Works of Shakespeare, Sherlock Holmes on a Disc, !CDPlayer, 3 caddies, etc.

Magneto Optical Drives (SCSI)

128Mb Magneto Optical SCSI Drive	£849
External case for above	£99
128Mb Blank Discs	£39

Hard Discs IDE

The no nonsense RISCOS 3 compatible HardDisc solution

The following are complete systems comprising of the NEW Desktop Projects IDE interface, hard disc, mounting brackets, cables, utilities disc and manual.

Archimedes Internal

Archimedes Internal hard discs. Not suitable for A3k,A3010-A3020

40Mb 17ms	£195
120Mb 16ms Cache	£295
200Mb 13ms Cache	£395
330Mb 12ms Cache	£695
520Mb 12ms Cache	£895

A5000 Exchange Drives

These systems are only available for the A5000 only.

120Mb 16ms Cache	£200
200Mb 13ms Cache	£300

A3000/Archi External

40Mb 17ms	£275
120Mb 16ms Cache	£375
200Mb 13ms Cache	£475
330Mb 12ms Cache	£775
520Mb 12ms Cache	£975

A3000 Hard Cards

20Mb Internal+User Port	£189
30Mb Internal+User Port	£189
60Mb External+User Port	£329

A3010 Hard Cards

20Mb Internal	£199

A3010 Ultimate Multi-Podule HD

20Mb Internal	£269
60Mb External	£399

SCSI

The following are complete SCSI HardDisc Systems comprising of a Morley SCSI interface, HardDisc, mounting brackets, cables, utilities disc and manual.

Archimedes Internal

Not suitable for A3k,A3010-A3020

105Mb 18ms Cache	£429
180Mb 18ms Cache	£599
330Mb 12ms Cache	£899
520Mb 12ms Cache	£999

A3000/A300/A400 External

105Mb 18ms Cache	£509
180Mb 18ms Cache	£699
330Mb 12ms Cache	£979
520Mb 12ms Cache	£1049

Removable Hard Discs

44Mb (Inc one cartridge)	£499
44Mb Cartridge	£55
88Mb (Inc one cartridge)	£599
88Mb Cartridge	£99

The above are external units with SCSI card.

SCSI Controller Cards

Morley Uncached	£139
Morley Cached	£179

Archimedes, A3000, A5000 Software

Applications

ABC Compiler (Oak)	£77
Advance (Acorn)	**£95**
Ancestry (Minerva)	£59
Arc DFS (Dabs)	£22
ArcComm2 (Logotron)	£52
ArcLight (Ace)	£40
ArcTerm 7 (Serial Port)	£62
Arcticulate (4D)	£20
Arctist (4D)	£20
Armadeus (Clares)	£65
Artisan 2 (Clares)	£49
Art Works (CC)	**£129**
Atelier (Minerva)	£69
AUN/Level 4 FileServer (Acorn)	£395
Autosketch v2 (Autodesk)	£65
Cable News (Lingenuity)	£165
CADet (Minerva)	£139
Chameleon 2 (4Mation)	£35
ColourSep (ICS)	**£15**
Compression (CC)	£35
Control Panel (Lingenuity)	£14
Desktop Assembler (Acorn)	£125
Desktop C (Acorn)	£180
Desktop Office (Minerva)	£95
Desktop Publisher (Acorn)	£125
Desktop Thesaurus (RISC Dev)	£19
Digital Symphony (Oregan)	**£40**
Draw Print-Plot (Oak)	£39
EasiWord 2 (Minerva)	£55
EasyWriter II (Icon Tech)	£126
Einstein (Ace)	£106
Equasor (CC)	£37
Euclid 2 (Ace)	£55
Eureka (Longman)	**£99**
First Word Plus v2 (Acorn)	£65
Font FX (DataStore)	£9
Font Starter Pack (Acorn)	£35
Gammaplot (Minerva)	£36
Genesis 2 (Oak Solutions)	£109
Graphbox v2 (Minerva)	£57
Graphbox Pro (Minerva)	£109
Hard Disc Companion II(RISC)	£45
Hearsay II (RISC Dev)	£69
Hotlink Presenter (Lingenuity)	£41
Home Accounts (Minerva)	£34
Illusionist (Clares)	£79
Imagery (Palette Studios)	£69
Impression v2 (CC)	**£125**
Impression Junior (CC)	£75
Impression Bus Supp (CC)	£39
Inter-Sheet II (CC)	£30
Inter-Word (CC)	£30
MasterFile III (RISC Dev)	**£47**
Midnight Express (Mid. Graph.)	£39
Mogul (Ace)	£20
Notate (Longman)	£54
Ovation (RISC Dev)	£95
PCB (Oak)	£99
PC Emulator (Acorn)	£95
PenDown Plus (Longman)	**£68**
Pin Point (Logotron)	£79
PipeDream 4 (Colton)	**£129**
Playback (RISC Dev)	**£19**
Poster (4Mation)	£75
Presenter 2 Hotlink (Lingenuity)	£33
Presenter GTi (Ling)	£66
Pro Artisan (Clares)	£79
ProDriver DJ500C/550C (Ace)	**£37**
Realtime Solids Modeller (Sil)	£99
Render Bender v2 (Clares)	£99
Resultz (Colton)	£TBA
Revelation II (Logotron)	£110
Revelation ImagrPro (Logotron)	£127
Rhapsody v2 (Clares)	£49
Rhapsody v3 (Clares)	£79
RISCType (CIS)	£16
Rythmn Bed (Clares)	**£40**
S-Base Personal (Longman)	**£95**
S-Base Developer (Longman)	**£175**
S-Base Developer + (Longman)	**£275**
Schema (Clares)	£99
Serenade (Clares)	**£109**
ShapeFX (Datastore)	£9
ShowPage (CC)	£130
SmArt (4Mation)	£50
SmArtFiler (4Mation)	£32
Snippet (4Mation)	£35
Speech! (Superior)	£15
Splice (Ace)	£27
Squirrel Database (Dig Serv)	**£120**
Squirrel 'C' Developers Toolkit	**£99**
StartWrite (Icon)	**£55**
TechWriter (Icon)	£159
Titler (Clares)	£119
Topogropher (Clares)	**£69**
Touch Type (IOTA)	**£39**
Tracker (Serial Port)	£37
Turbo-Type (CIS)	**£20**
Tween (Ace)	£27
TypeStudio (RISC Dev)	£43
Vector (4Mation)	£75
Vox Box (Clares)	£49
WordWorks (CC)	**£38**
Wordz (Colton)	**£95**
Worra CAD (Oak)	£83

Items in red are New/Low price

Games

2067BC (Oregan)	£17
Aggressor (Atomic)	£18
Air Supremacy (Superior)	£17
Alderbaran (Evolution)	£26
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Battle Chess (Krisalis)	**£22**
Black Angel (4D)	£26
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Blowpipe (Eclipse)	£15
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Bug Hunt in Space (Minerva)	£13
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-Includes Man Utd, J Khan Squash,	
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Chess 3D (Micro Power)	£19
Chocks Away 2 (4D)	£19
Chocks Away Extra Miss(4D)	£15
Chocks 2 Compendium (4D) **2Mb**	£26
Chopper Force (4D)	£22
Chuck Rock (Krisalis)	£19
Cyber Chess (4D)	**£26**
Cyborg (Alpine)	£19
Cycloids (Software 42)	**£19**
Dreadnoughts (Turcan)	£26
Dungeon (4D)	**£26**
Elite (Hybrid)	£32
Enter the Realm (4D) **2Mb**	£19
E-Type Compendium (4D)	£19
Fervour (Clares)	**£19**
Galactic Dan (4D)	£19
Games Wizard (Leading Edge)	**£26**
GODS (Krisalis)	£19
Gribbly's Day Out (Coin-Age)	£19
Grievous Bodily 'ARM (4D)	£19
Guile (Dream)	£22
Heimdall (Krisalis)	**£22**
Hero Quest (Krisalis)	**£22**
Holed Out Compendium (4D)	£19
Ibix the Viking (Minerva) **(OS2)**	£14
Iron Lord (Cygnus)	£14
Ixion (Software 42)	**£19**
James Pond (Krisalis)	£19
Kerbang (Eterna)	£15
Krisalis Collection	**£22**
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-Pipemania, Terramex & Revelation	
Last Ninja (Superior)	£19
Legend of the Lost Temp **(OS2)**	£19
Lemmings (Krisalis)	£19
Loopz (Audiogenic)	£18
Lotus Turbo Challenge II (Kris)	£19
Mah-Jong Patience (CIS)	£15
Mah-Jong The Game (CIS)	£18
Man United Europe (Krisalis)	£19
Master Break (Superior)	£15
Micro Drive 2 (CIS)	£26
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Nebulus (Krisalis)	£19
Oh No More Lemmings (Kris)	£16
Omar Sharif's Bridge (Krisalis)	£22
Orion (Minerva)	£14
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Paradroid 2000 (Coin-Age)	**£19**
Pesky Muskrats (Coin-Age)	£19
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-Includes Conqueror, Rotor,	
-No Excuses & Hostages	
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Repton 4 (Superior)	£18
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-Includes Apocalypse, Holed Out,	
-The Olympics & Inertia	
Real McCoy 3 (4D) **2Mb**	£26
-Includes Powerband, Nevryon, Drop	
-Ship & The WIMP Game	
Real McCoy 4 (4D)	**£26**
-Includes Galactic Dan, Grievous	
-Bodily 'ARM, Cataclysm & X-Fire	
Saloon Cars Deluxe (4D)	£26
Saloon Cars Del Extra Courses	£16
Sim City (Krisalis)	**£26**
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Starch (Dabs Press)	£12
Superior Golf (Superior)	£15
Sup Golf Extra Courses (Superior)	£14
SWIV (Krisalis)	£19
Technodream (Superior)	**£19**
ThunderMonk (Minerva)	£14
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Top Banana (HEX)	£19
Twin World (Cygnus)	£14
Waterloo (Turcan)	£19
X-FIRE (4D)	£19
Zarch (Superior)	£15
Zool (Gremlin Graphics)	**£22**

2Mb - RAM required for RISCOS3.1
OS2 - Runs on RISCOS2 only

Education

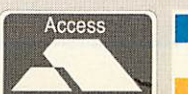
Adv. Playground 5+ (Storm)	£17
Amazing Ollie 4+ (Storm)	£14
Badger Trails (Sherston)	**£30**
Coffee 9+ (Storm)	£28
Concept Designer (Logotron)	£23
Converta-Key	£15
Crossword+ 8+	£19
Crystal Rainforest (Sherston)	**£35**
Data Word (Triple R)	£15
Desktop Folio (ESM)	£89
Farmer Giles 2 (CTS)	£17
First Words & Pictures (Chk)	£26
Flight Path 9+ (Storm)	£28
Freddy Teddy (Topologika)	£19
Freddy Teddy's Adv (Topol.)	£17
Fun & Games 5-9	£18
Fun School 2 (Database)	£15
Fun School 3 (Database)	£18
Fun School 4 (Database)	**£18**
(Please spec. age group <5, 5-7, >7)	
Giant Killer (Topologika)	£17
House of Numbers (Chalk)	£19
Hyperbook Reader (Logotron)	£48
Hyperbook Lib (Logotron)	£110
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Letters and Pictures (Chalk)	£18
Logo (Logotron)	£60
Magpie (Logotron)	£49
Maps & Landsc. 1/2 (Chk) ea.	£19
Money Matters (Triple R)	£20
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Numerator (Logotron)	£60
Numerator Chaos (Logotron)	£19
Ollie Octupus Sketch Pad (Storm)	£14
Pendown (Logotron)	£50
Pendown Fonts (Logotron)	£17
Picture Book (Triple R)	£20
Pin Point Junior (Logotron)	**£23**
Pirate (Chalk)	£18
Prime Art (Minerva)	£69
Puncman 1-2,3-4,5-7 (Chalk) ea.	£18
Reversals (Chalk)	£18
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Smudge the Spaniel (Storm) 4-8	**£22**
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Target Maths (Triple R)	£20
10/10 Early Essentials <7yr (3R)	**£19**
10/10 English (3R) 6-16yrs	**£19**
10/10 Maths (3R) 6-16yrs	**£19**
Things to do with No's (SS)	£19
Things to do with Words (SS)	£19
Words and Pictures (Chalk)	£18

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Desktop Projects Ltd

Tel: 061-474 0778

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JUN 93

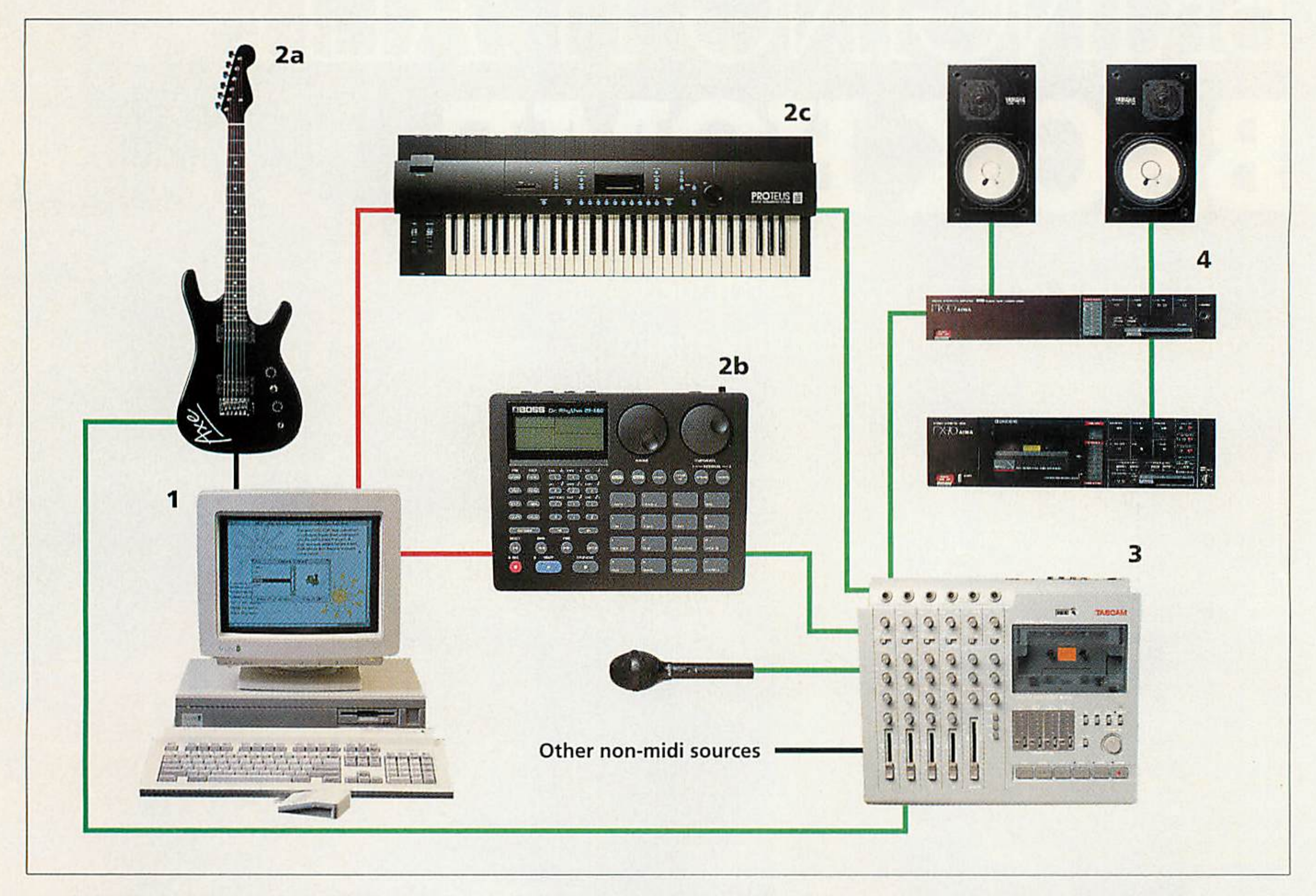
BRINGING IT ALL BACK HOME

Richard Garrett looks at how the Archimedes can become the core of a home recording studio

John Graham is a semi-pro musician. He writes and records his own music, plays guitar in a couple of bands and does occasional work as a sound engineer in a recording studio. Not content with this, he now wants to branch into music technology.

'Although I do some studio work, I record my own stuff at home,' John told us. 'I have a small home studio which consists of a Tascam 488 eight-track recording studio plus a Roland GR50 guitar-

ROBERT CLIFFORD



The A5000 with EMR midi podule fitted (1) is now central to John's home studio. Connected to it with 16 channels apiece would be the guitar synthesiser (2a), the drum machine (2b) and the new keyboard (2c). These are then connected to the portastudio (3) and finally played on the hi-fi equipment (4)

COLOUR KEY: —— Midi data —— Audio signals —— Non-midi data

synth, a Yamaha drum machine, amps, a microphone, and some outboard fx units: reverb, delay and so on.

'For years, my approach to recording has been to punch a complete song structure into a drum machine, record it in stereo on two tracks of the eight-track and, once I've done that, play guitars, bass and acoustic piano onto the other tracks. When a tune is finished, I mix it down onto Dat (digital audio tape).

'This approach is fine, but arrangements are cast in stone from the beginning. With Midi sequencing, I could write arrangements on the computer with electronic instruments playing all the non-improvised bits, then battle with all those parts to produce a synthesised version before I put anything on tape. That way, drums could respond to the overall sound instead of dictating it.

'I'm obviously going to need a Midi keyboard for this but I've got enough synth stuff on the GR-50, so I want something more natural. On the software side, I want something that can display music notation but since I've played solos into notation software before, only to be presented with bizarre hemi-demi-semiquavers, I would like to have other display formats as well.

'I also want the ability to tidy up my keyboard playing without getting too metronomic and to add and delete verses, choruses and so on without loads of editing.

'Also, the material I write is quite complex, and I've heard that Midi can get flooded with information. Is there a way around this? I've about three and half grand to spend and I'd like to split it evenly between the computer and synth.'

THE SOLUTION

We would recommend an A5000 with an ElectroMusic Research Midi 4 podule. Three-box hard disc computers lend themselves to music, because it's easier to organise their component parts around the Midi equipment. When Midi podules for the A4000 are available they may offer a cheaper alternative.

Unlike most Arc Midi interfaces which only carry one Midi in and one Midi out socket, the Midi 4 features four independent Midi ports, each with its own input and output. Each port can carry 16 channels of Midi data. This means the device could, potentially, address 64 synthesiser voices at one time and play about 80 notes. It would also give the illusion of doing so simultaneously.

It is unlikely that John's current setup will generate anything like this quantity of data. The advantage of a multiple port interface is that his GR-50 can be given its own pair of sockets, maximising the bandwidth available to it and minimising the chances of Midi clog. On his setup as it is now, each Midi device could have sixteen channels.

For a keyboard, I'd suggest an E-mu Proteus MPS Plus. This is a playable instrument that generates around 400 orchestral and pop sounds from high quality samples.

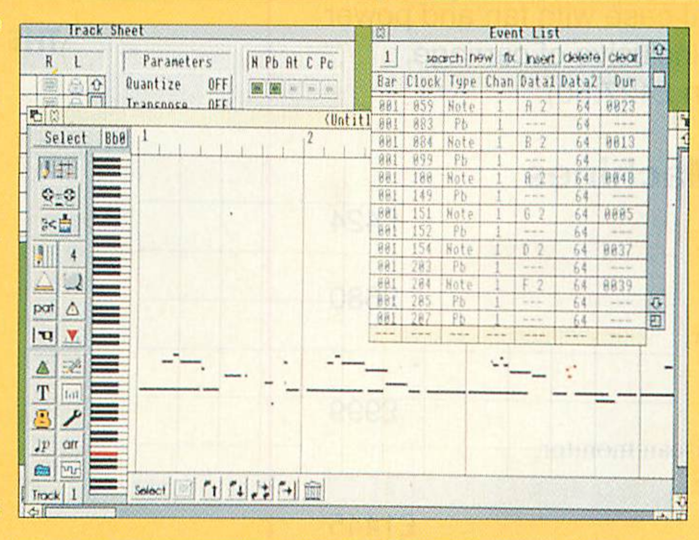
As for software, Clares' suite of music packages is the best bet here. This is made up of a piano-roll sequencer, a drum editor, and a notation editor: *Serenade*, *Rhythm Bed* and *Rhapsody 2* respectively. With this combination, he can record Midi signals direct from his guitar synth or keyboard using *Serenade*, create drum patterns in *Rhythm Bed* and sync them together to produce up to 16 Midi tracks.

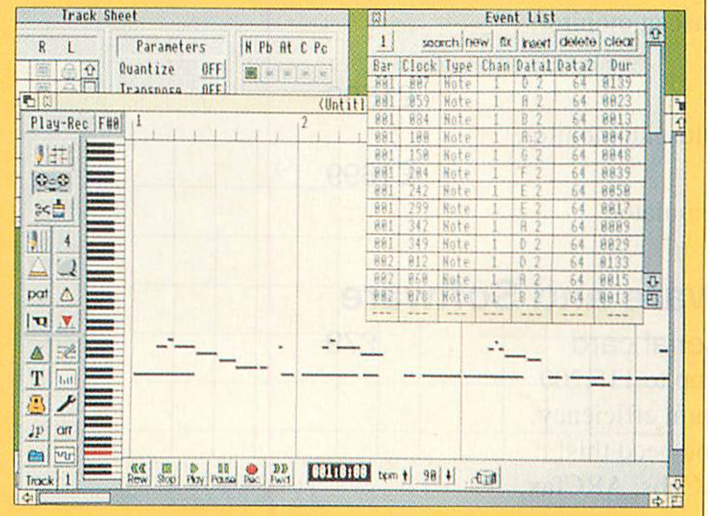
Once he's written music on the sequencer, he can change tempo, duplicate sections and move them in the arrange window, to get the sound he wants. He can save work in Standard Midi File format then pass it to *Rhapsody* to convert to notation dots.

TECHNIQUES

Many Midi-capable programs can record notes from the keyboard and play them back but not all are full-blown sequencers. What distinguishes a true sequencing package like *Studio 24 plus* or *Serenade* from the rest is the capacity to record all incoming Midi data in real time, with sufficient accuracy to retain the phrasing of the music played. This being the case, this month's techniques concentrate on the process of real-time capture of Midi data and how to edit out any mistakes which you made in your playing.

Serenade is a grid edit sequencer; it represents notes on a bar graph similar to the paper rolls used to program a player piano. The horizontal axis shows time in bars and the vertical axis shows pitch values as a piano keyboard. From the main window or grid, you can call up various editors including the Track Sheet, Event List and the Arrange window. The main window has three modes: Draw/Edit, Cut & Paste and Record/Playback, which is where we'll start.





Recording Midi data into *Serenade* is much like recording real sound into a multitrack tape recorder. In an analogue studio, the engineer would often start a session by recording a metronome beat (click track) at the desired tempo for the song. This supplies an accurate reference, mostly for the drummer, so subsequent tracks keep steady time. *Serenade* has a built-in metronome. You can set this to any Midi channel, note and volume (I use the closed hi-hat cymbal on my drum machine) so it plays on every beat of your song.

To record a track, you must first 'record enable' it in the track list window then hit Record and Play on the tape recorder controls at the bottom of the window. When you do this, an advice box appears saying 'recording on track 1', or whatever, and the tape counter turns red, counting down for four beats and playing the metronome before recording any Midi data. This is the count in, the computer's way of shouting 'one, two, three, four...' at the start of the tune. After the count, the tape counter turns black, starts counting bars elapsed and records whatever you play.

When you've finished playing, you click on the Stop icon and black lines will appear on the grid showing the pitch and durations of the notes you have played. The top screenshot shows typical output of a guitar synth with the Event Editor open. This demonstrates all the pitch bend data (marked Pb) recorded, as well as unwanted 'grace notes' produced by strings bending and squeaking under the player's fingers. Having got the data in, you can edit out unwanted notes from the Draw/Edit mode and alter or remove pitch bend information from the Event List. Alternatively, you can trash all the pitch bend data on that track from the Track List. The top screenshot shows the original track in *Serenade*: the lower shot shows the same guitar phrase after editing, with all the pitch bends removed and a few notes added and taken away.

If you record some mistakes, there are two ways to patch the track up. One is to use cut and paste-style edit controls to copy a better-played version of the phrase from elsewhere in the tune and use that to replace the faulty part. The other way is to record the section again by letting the 'tape' run until you get to the bit you want to change and then hitting the record button. Recording engineers call this a drop in and it's harder than it sounds, especially when you've got both hands on a guitar. *Serenade* has an automatic drop in feature. From the small menu on the record button, you 'auto' option, then record the track again. No data is written into the sequencer until a Midi note is received from the instrument you're playing. When *Serenade* hears the note, it records from that point until you drop out by selecting the Stop icon.

Once you have one track recorded, you go on recording others and build up whole tunes and produce arrangements, using *Serenade* to play repeated groups of bars (verse/chorus and so on) in a specific order. This is done using a simple editor called Arrange window, where adding an extra chorus is a matter of one mouse click. All an awful lot easier for John than the arduous task of typing an extra sixteen bars into the dmc.

Serenade (reviewed last month) can address multi-port Midi cards, has sufficient resolution to accurately capture his phrasing and has quantisation features, to tidy up his keyboard playing.

For John, one of its most important features is the ability to edit all Midi data, not just the notes. From the Event List, he can not only change note lengths and start times, but also edit the control signals that create vibrato effects, fix the stereo position of instruments, and so on.

THE FUTURE

The hardware and software for the complete computerisation of John's home studio costs over £3000 but it doesn't have to stop there.

Other options include other Midi-controlled devices or time synchronisation with the portastudio. For the present, however, John's priority will be to concentrate on mastering the software and *Serenade* should be enough to keep most musicians happy for quite some time.

PRODUCT DETAILS

HARDWARE
Product: A5000 HD80
Supplier: Acorn
Tel: (0223) 254254
Price: £1399 ex VAT

Product: Midi 4 podule
Supplier: EMR
Tel: (0702) 335747
Price: £112 ex VAT

Product: Proteus MPS keyboard
Supplier: E-mu Systems
Tel: (031) 653 6556.
Price: £1255 inc VAT

SOFTWARE
Product: Serenade
Supplier: Clares
Tel: (0606) 48511
Price: £135 inc VAT

Product: Rhapsody 2
Supplier: Clares
Price: £61.95 inc VAT

Product: Rhythm-Bed
Supplier: Clares
Price: £49.95 inc VAT

Product: Studio 24plus, v3
Supplier: EMR
Tel: (0702) 335747
Price: £212 ex VAT



Graphics on the Acorns has been poorly covered in print until now. Rob Miller looks at a book that aims to set that right

PICTURE BOOK

Arc-related books have always been a bit thin on the ground, and graphics is an area that has been particularly badly covered. *Graphics on the ARM Machines* aims to rectify the situation although it does not claim to be a beginners guide: a point made clear early on.

The book is divided into four rough sections: an explanation of vector (or line) graphics; an explanation of bitmap (or pixel) graphics; an explanation of other graphics techniques, such as ray tracing, image processing and animation; and a series of appendices detailing such areas as printing.

While you can jump around from section to section, terms used later in the book often relate to those discussed earlier, so it is easier to take the book in chapter order. Throughout each section, references are made to actual programs where possible and relevant. So, in the chapters covering vector graphics, *Draw* is discussed and each of its features explained. As in the rest of the book, some experience of the product is assumed, the author doesn't try to replace the manual.

Where the book really scores, though, is in its explanation of how and why tools in *Draw* work the way they do. In particular, the mysterious 'Winding rule' suddenly becomes clear and easy-to-understand. The liberal sprinkling of hints throughout also clarifies some of the more obscure features of *Draw*.

Because *Draw* and *Paint* are available to anyone with an Acorn 32-bit computer, both are used as examples and discussed at length. Roger Amos also takes a detailed look at programs in the public domain (free from PD libraries and therefore accessible to everyone), or that are unique in their field, like 3D editor *Euclid* and associated programs.

Other packages are looked at more briefly, partly because there are so many, partly because an in-depth study of, say, Computer Concept's *ArtWorks* would fill a book. *ArtWorks* does get a mention, though, as does 4Mation's *Vector* and Logotron's *Revelation 2* (since superseded by *Revelation Image Pro*).

It doesn't matter particularly if you don't have all the software discussed to hand, many of the concepts can be applied to similar programs. Both *DrawPlus* and *Vector*, for example, are mentioned, the former being a cut-down, shareware version of the latter.

While the author makes a worthy stab at getting ideas across in plain English, jargon is unavoidable. Even though obscure terms are explained as they are introduced, no glossary is provided. This would have helped the novice, who has to constantly flick back.

There are omissions. No real mention is made of graphic languages such as *Logo*, and complex areas, such as ray tracing, are covered superficially. In a book with such a broad brief, though, it is inevitable some programs will be left out.

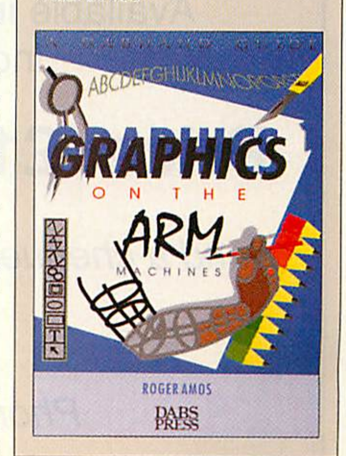
The author covers most topics and ideas through his method of explaining and using the programs. The text is clear throughout, with plenty of pictures and diagrams illustrating points. A colour section in the centre of book including the picture above gives a good idea of what you can achieve.

CONCLUSION

The book is certainly not for the absolute beginner, but neither will it advance the knowledge of experienced graphics users. I would guess the target reader would be someone with some experience of the Archimedes, but who wants to know more about graphics before laying out money on extra software or hardware. For this person it's £15 well spent, and, furthermore, is really the only book of its kind.

PRODUCT DETAILS

Title: Graphics on the ARM Machines
Author: Roger Amos
Publisher: Dabs Press
Tel: (0772) 623000
Price: £14.95



BACK TO THE DRAWING BOARD

John Nolan runs the rule over ProCAD, the new Arc package which claims to be a contender to AutoCAD at a fraction of the cost

Right at the start *ProCAD*, the latest CAD product from Minerva, proclaims itself to be a drafting package. Not, you may note, a design package. For an industrial designer or architect, the design *is* the drawing; looks are what count. For the engineer, design goes deeper than this: it is the calculation process behind the drawing.

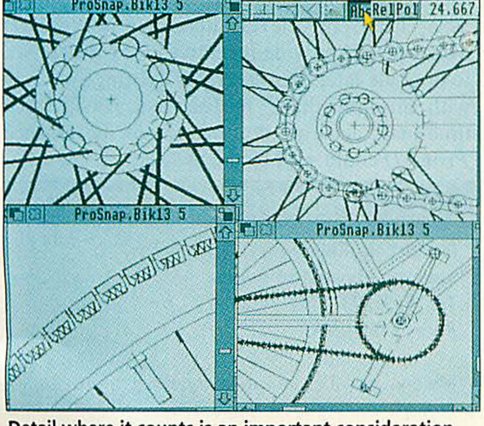
From this point of view, Minerva's description is accurate. *ProCAD* is a drafting package. It is aimed at architects, planners, mechanical, civil, electrical, and electronic engineers – anyone, in fact, who needs a package for fast, accurate drafting.

SURVEYING THE PROCAD SCENE

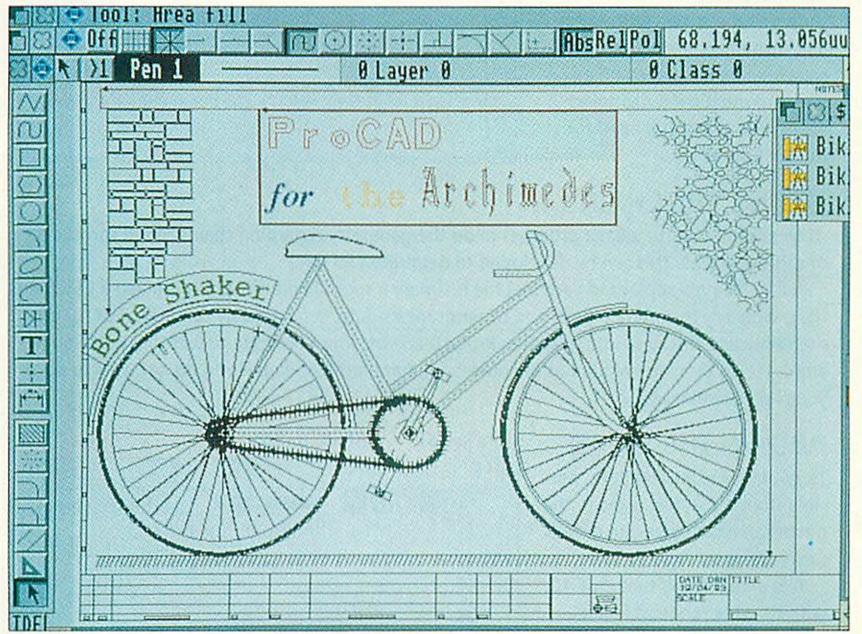
CADet, a cheaper version of *ProCAD*, was reviewed in the April *Acorn User* and displayed technical drawing to BS308 standard. *ProCAD* is the next step up and, in Archimedes terms, is expensive. However, *ProCAD* does claim to be comparable to *AutoCAD*, the very costly PC-package which is now the industry standard.

As one might expect, *ProCAD* shares some features with *CADet*, including tools, snaps, symbols, symbol manipulation, global update of symbols and multicopy. *ProCAD* does have more ready-made drawings and more extensive symbol libraries than *CADet*, though.

More important still, it has extra tools with additional functions and more snaps. *ProCAD* also employs user-definable scales, taking information from the drawing and using it to perform arithmetic, generate reports and bills of quantity. Symbols are stored in parametric form, so one symbol can generate many variations by



Detail where it counts is an important consideration



The bicycle provides a standard test for a drafting package

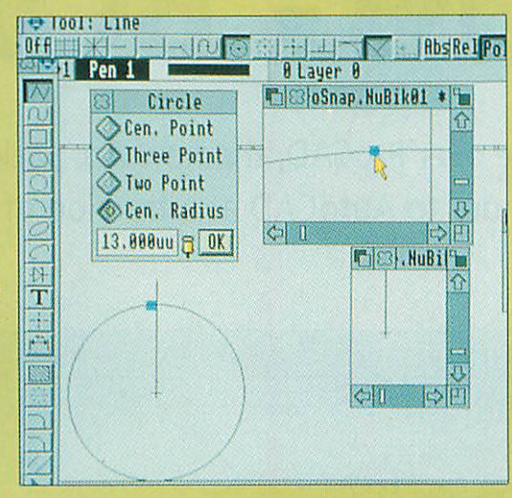
FEATURE CHECKLIST

	CADet	ProCAD	AutoCAD
Price (ex VAT)	£145	£495	£2800+
Platform	Arc	Arc	PC 486
Ram needed	1Mb	1Mb	4Mb
Disc space needed	–	–	42Mb
Multi-task	Yes	Yes	Very slow
Accurate snaps	Yes	Yes	Yes
Object grouping	Yes	Yes	No
Global symbol update	Yes	Yes	No
Instant symbol variation	No	Yes	Yes
Architectural fills	No	Yes	Yes
Multiple undo	Yes	Yes	Yes
DXF supported	No	Yes	Yes
CSV supported	Yes	Yes	No
Bills of materials	No	Yes	Yes
Reports from text objects	No	Yes	Yes
Isometric ellipses and circles	No	Yes	Yes
Maximum paper size	A3	A0	A0
Plot CAD or HPGL files	Yes	Yes	No

PROCAD IN ACTION

To demonstrate how *ProCAD* works in more detail, I chose to construct a bicycle, since it tests a number of engineering drafting processes: from the detail found in the chain and sprockets, to the overall shape of the bicycle itself.

SHAPE MAKER



The first decision is one of scale. I decided on a 40in x 68in bicycle which was then drawn at a 1/5 scale on an A3 frame.

You have to define your own scale factor, give your scale a two-letter name and *ProCAD* does the rest.

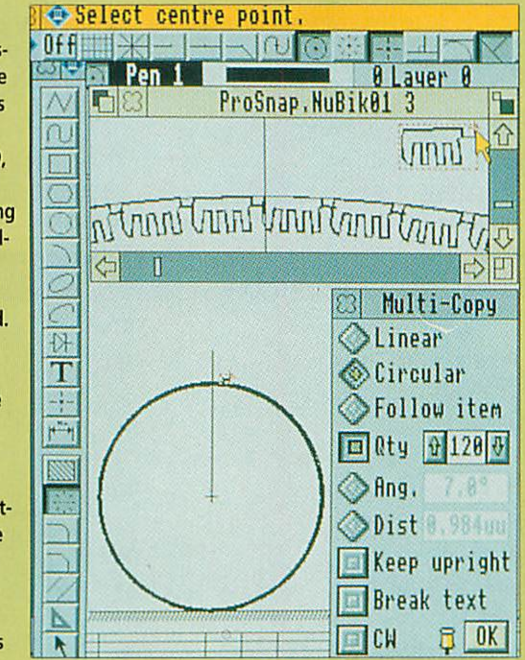
A base line is drawn first, then the outlines of the wheels – as shown in the screenshot – all quickly and accurately. Although snaps can be used in combination, I found it better to select only those snaps you need for the next point.

FITTING THE CHAIN

At this point, I wrote a Basic program to do the geometry regarding chains round sprockets of different sizes. This can be developed to generate CSV data.

A CSV (comma separated variable) file is simply a special Edit file which is given a CSV file type, with x, y co-ordinate pairs and other graphics data, separated by commas. *ProCAD* can then translate this data into graphics. *ProCAD* accepts input accurate to 0.001in. or 0.025mm. and 0.1° and there are a number of sources for standard CSV data if you do not wish to do your own calculations.

ADDING THE TREAD



The outline circles and lines, possibly from a CSV file, provide the guides on which accurate details can be hung.

It is in this detail that *ProCAD*, with its wide range of facilities, really comes into its own. Making extensive use of the circular multicopy, I drew the tread round the tyre very easily. Let's take a look at the drawing of the tread. The pattern repeated every 3° was used to give a realistic effect. Enlarged views are made to improve accuracy.

A vertical construction line provides an intersection, as a reference point for the tread pattern. An accurate point 3° to the left of the intersection is made using polar co-ordinates.

The line thickness is 0.01in. The point co-ordinate is input as (13,93°), via the co-ordinate window. For Multicopying, the tread pattern must be grouped and the reference point placed at the construction line intersection.

The results of multicopy can be seen in the shot. Due to *ProCAD*'s accuracy, only the number of copies (in our example 120) needs to be entered in the dialogue box, not the number of degrees (in this case 3°). In this mode, two points were selected, the Centre Point (in this case the centre of the wheel) and the Start Point (here the vertical construction line intersection). You have to wait a few seconds before seeing the tread drawn around the wheel. On the subject of drawing speed, the bicycle file, with a short symbol list, is over 210K. Some optimising of memory is probably necessary.

Although we chose a bicycle as our example, Minerva cites many other uses, such as architectural design – in fact any task which requires accurate drawings to scale.

changes in shape, size and orientation on the drawing. *ProCAD* also uses automatic dimensioning and a degree of calculation; for instance, units can be entered as 15/5.

ProCAD's great merit is versatility. The package can import and export graphics as *AutoCAD*-compatible DXF files. There is plenty of DXF data available, some in the public domain, some from RIBA (The Royal Institute of British Architects).

This means that *ProCAD* can call on a wide, and expanding range of graphics information in DXF files and symbol libraries. Secondly, *ProCAD* can carry out design work via Basic programs or spreadsheets, and load the data via CSV files.

PROCAD IN USE

For those familiar with *Draw*, *ProCAD* is very user-friendly and many features can be reconfigured by the user. The multiple undo feature and the promptings from the message bar speed up the learning process enormously but there is also a tutorial included in the price.

It is difficult to cover all of *ProCAD*'s features in this article, so we chose to construct a bicycle to show you the package in action (see our boxout). Many different features were used in the process: for example, there is a whole army of techniques available available to hide the part of the bicycle spoke that runs behind the forks. I used Break and Cutout to remove the unwanted part of the spoke.

Then there is Object Editing and Extension Lines. Objects can be placed in different layers (there are 32). A layer can be made non-selectable to protect it. It can also be made completely invisible. These layers might be particularly useful for, say, a building design, where a given floor could have different drawings for room layout, services or dimensions. If this is not enough, there are levels that alter the way objects sit above one another: useful for selecting overlapping features.

There are many other powerful features including reports on the material used, complete with costings. There are bugs but this is to be expected in the early stages of such a complex package – *ProCAD* only debuted in January this year. Most of the bugs were minor and were corrected immediately by Minerva.

CONCLUSION

If your budget is tight and you can afford to sacrifice certain features, *CADet* is more suitable as a cheap entry level alternative to *ProCAD*. Minerva will provide incentives for *CADet* users to upgrade later. However, for existing Arc users with an immediate, professional need, where time and accurate drafting are of the essence, *ProCAD* could well be the answer.

PRODUCT DETAILS

Product: ProCAD
Supplier: Minerva Software
Tel: (0392) 737756
Price : £495 + VAT

Minerva provides an evaluation disc for CADet or ProCAD, costing £5, refundable with order.

IN BRIEF

Puzzling jigsaws for juniors, furnishing for 3D fans and colour printing for Canon BJ-10 owners

TINY PUZZLE

Supplier: Topologika
Tel: (0733) 244682
Price: £25+VAT

Computer-based, jigsaw puzzle programs have always been a great way to develop visual discrimination and recall skills. A typical program works like this. First, a picture is loaded on screen. After a brief pause, it is split into a number of squares which are jumbled up. Then the children have to unravel them.

There were a number of such programs for the BBC B, but apart from *Jiglet* (4Mation) few have appeared for Risc OS machines. *Tiny Puzzle* follows the above formula with some interesting additional features. A useful *Big Pointer* utility is provided; this enlarges the pointer and helps young children with mouse control.



Tiny Puzzle helps young children to develop their visual skills

From the title screen the first picture is automatically loaded and scrambled into a 2x4 grid. During the program, you can alter the number of rows and columns of the grid up to a 4x4 matrix. If you get stuck you can sneak a look at the finished picture. Any picture can be printed out either partially-scrambled or complete. The program disc contains nine colourful source pictures while the accompanying resources disc has the same in outline only, making it harder to solve. In addition, there are another 11, increasingly complex pictures, plus alphabet and number bonds.

The program also provides a useful companion to *Tiny Draw*, from Topologika, from which pictures can be imported for jumbling. *Tiny Puzzle* pictures are Mode 15 sprites which can in fact be imported from any art package. However these must be compressed using a program such as Topologika's *Create*.

Tiny Puzzle will prove a useful and enjoyable program to have. My only criticism is the lack of an overlay keyboard option. More use could also have been made of sound. Overall though, a thumbs up for home or school use.

Chris Drage

SPEX

Supplier: ExpLAN
Tel: (0822) 613868
Price: £99 including full site licence

Spex has to be the easiest way of getting into home improvements. First of course: how big is your room, please? Rectangles only, no L shapes. Now what fittings would you like? In the Wall Fittings section commonplace items like windows and doors, pictures and power sockets are simply dragged on to the wall.

Moving onto the Furnishing section allows you to place items within the room, such as tables, chairs, cookers and a few other bits and pieces such as rugs and plants, even down to a mug of tea. Again simply drag this on your plan view.

So far all the design work taken on by ExpLAN's new design package, *Spex*, has been in two dimensions only. The wall fittings are designed on a vertical wall and the furnishing section designed on a plan view.

The magic really starts when you select View. You are almost instantly given a 3D view of everything you have designed so far, all coloured and in the right place. The mug of tea appears on the worktop (not under it), plug sockets are at an even height and so on. I would expect someone who is familiar with the Archimedes to be able to produce a 3D picture of a kitchen in 15 minutes from scratch. *Spex* also offers a simple spreadsheet analysis of your design, showing a full costings breakdown.

This brand new kitchen was created in minutes

Results come quickly. This will appeal to teachers of design subjects since discussion can be about design rather than how to get the computer to work. Here is a package that can also cover some of the difficult modelling strands of the IT National Curriculum (up to about Level 6) along with more obvious strands.

Although home users may like the look of the package, I find it difficult to see how it could be used. On the other hand, in a school, *Spex* could prove to be very good value.

Bob Harding

COLOURSEP

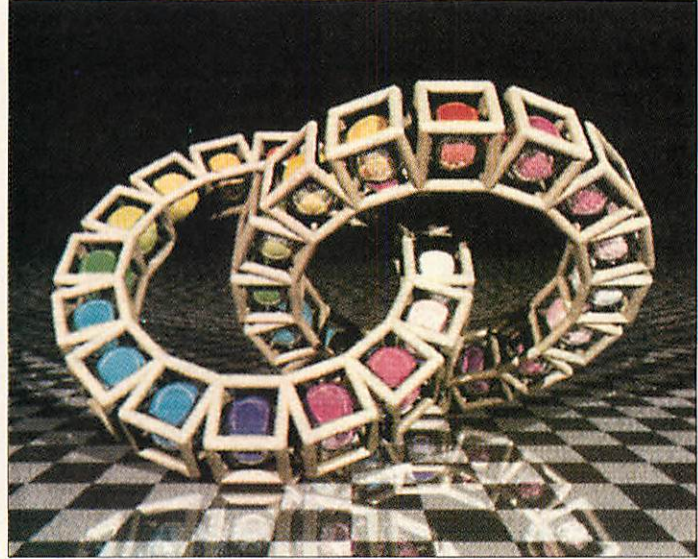
Supplier: Ian Copestake Software
Tel: 051-625 1006
Price: Software £30, cartridges and colour inks £80

ColourSep is a multi-tasking application that breaks down colour information generated by the computer into its cyan, magenta, yellow and black components. From an unobtrusive window, colour separations can be selected; the program then effectively filters out the other components.

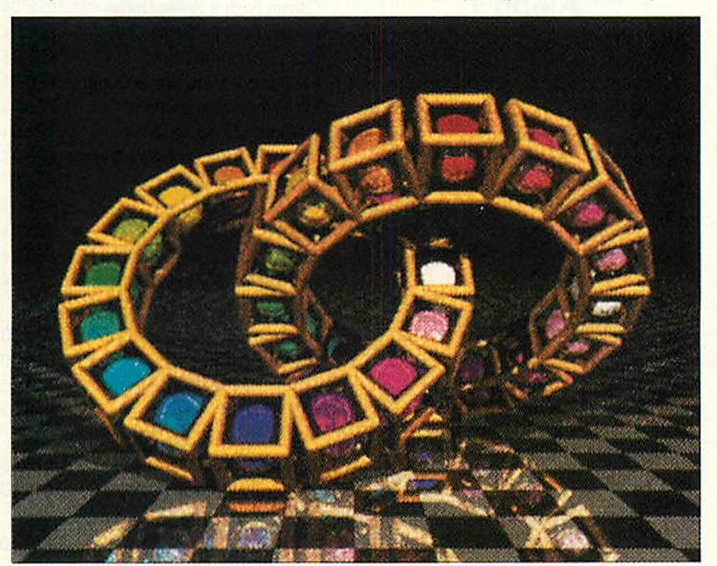
As with commercial printing and image setting, the four colours can be individually output and printed using a corresponding ink for each separation. But there is a problem with multipass printing on desktop printers in that the paper must be re-registered accurately enough to prevent separated prints 'drifting'.

This problem is largely alleviated by using a sheet-feeder, which is why *ColourSep* was originally targeted at HP DeskJet 500 owners. However, I decided to see whether the program could be used to good effect with my Canon BJ-10, sans sheetfeeder.

After a little experimentation, I discovered a way of re-registering the paper in the bubblejet near-perfectly, and having informed ICS of the method, the technique is now part of the *ColourSep* package. Colour printing requires colour inks, but neither Canon nor any other company sells colour BJ-10 cartridges. ICS, though, does offer a colour refill kit and cartridges.



A colour printout using the ICS software and a BJ-10 is shown above. When compared to the BJC-800 (shown below) it is lower quality but much cheaper



Emptying the cartridges and refilling them with coloured ink is lengthy and messy, but once complete and the program calibrated for linearity of the four inks (a simple operation performed in a window) printing is straightforward.

But separating and printing four times for each document, waiting for ink to dry, refeeding the paper and changing cartridges, makes mono printing seem warp-speed.

So is it worth the wait? Most definitely. For anyone who enjoys getting a lot from very little, *ColourSep* gives BJ-10 users the opportunity to produce full-colour prints of a quality comparable to a dedicated colour ink-squirter/dot-puncher under £1500. As no two cartridges are identical, I can see the possibility of slight positional variation but you would be unlucky if this was to cause a noticeable error.

ColourSep facilitates low-cost, true-colour proofing and enables you to revolutionise DTP work. Albeit a time-consuming process, the results are excellent, given the low price of the Canon-BJ-10.

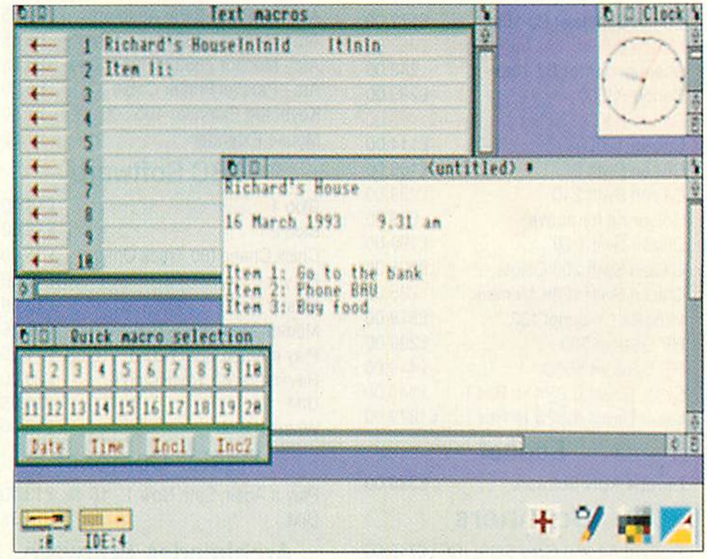
Jack Kreindler

TEXTAID 1.25

Supplier: Rheingold Enterprises
Tel: (0484) 846126
Price: £12.95 inc VAT

TextAid is an Archimedes desktop utility providing short-cuts for people using text editors. There are four distinct elements to the application: Macros, Print Control, Transfer and File Conversion.

Macros are strings of text (up to 80 characters) which you can drop into a page by selecting an icon or by pressing a function key. *TextAid* is able to store up to 20 of these. As well as the obvious uses involving ordinary text, these macros can also hold special characters that invoke other macros, insert current date and time or increment numbers.



TextAid can be put to use in some unusual ways

Print Control is similar to the Macro option, allowing you to insert strings into the text with one click of the mouse. In this case, though, the strings are printer 'escape sequences' for bold, underline and so forth. If you happen to have an ageing and unsupported dot-matrix printer, this could be for you. Transfer lets you paste from text icons or window bars into your current editor. This is useful for those who like to put their filenames at the end of their documents.

Finally, File Conversion can convert any Arc textfiles to and from CSV (comma separated variables) or alternatively TDA (Tab Delimited Ascii) for use in data handling.

TextAid is an easy-to-use package (although I must admit the manual could be simplified) and it will be useful for users who do a lot of work in *Edit*.

It can hardly be described as expensive and if any of its rather specialised functions appeal to you, it should be money well spent.

Richard Garrett





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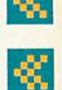
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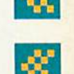
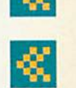


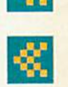
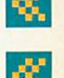
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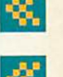
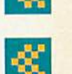
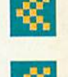
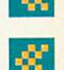
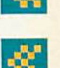




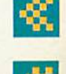
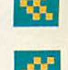









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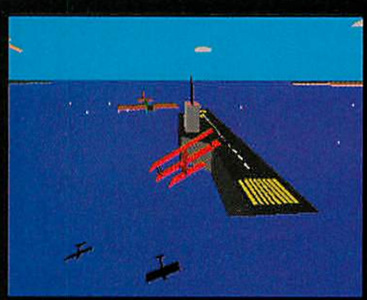
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GAME SHOW

Dominik Diamond was running behind schedule at the *BBC Acorn User* Show. The reason? A shoot-em-up called *Axis*. TV's *GamesMaster* supremo was hooked on the newest release from Power Station, on the TBA Software stand at the show in Harrogate last month. His public relations woman had to virtually drag him back to his itinerary.

So what's with *Axis*? Was Dominik just being polite or has this game got real staying power? It's a top-down view of a military base. You pilot a small tank around the grounds, blasting away bad guys such as armoured vehicles and unrepentant gun emplacements. When you control the tank, it stays still. Meanwhile, the whole landscape rotates around it with remarkable smoothness. There are plenty of power-ups to collect and the military base becomes more of a catacomb the further on in the game you get. To answer the question, tune in to next month's reviews, when we'll give *Axis* the once over.



Dominik Diamond played his way around the Harrogate show in April, hosting the games competition on the *Acorn User* stand. The game in question was *Technodream* and the winner will be revealed next month. But what did Dominik really think of the Acorn games scene? Find out in the Moxon interview on the back page this month.

TBA Software has another couple of games in development: a futuristic racing game called *Free Run*, where you pilot a spaceship like the land-speeders in *Star Wars*, and a *Uridium*-style shoot-em-up called *Psycho Squadron*.

Also at the show, CIS had news of forthcoming games. It has just released *Humanoids* and *Robotix* (sold as one disc, and reviewed this month) and has *Killer Bugs* ready to roll. *Killer Bugs* is similar to the *Space Invaders* genre. CIS has a version of the old arcade game *Pang* in the pipeline: you burst big red bubbles by firing spikes up into the air.

This, of course, has already been done by *Blitz*, from Arxe Software. *Blitz* has become one of the most popular two-player games in the Acorn world since release two years ago, and has superb graphics and amusing sound effects. CIS is confident its own version, *Harry Harpoon Goes to Harpoon Land*, will be better.

CIS has also added *Chinese Patience* to its compilation pack of card games – *Card Mania* – reviewed in the March issue. CIS is on 071-226 3340. There are a couple of new budget games. *Mayhem*, from Dutch company Focos, is like the Eterna game *Tactic*. It has a playing area similar to *Tetris*, falling spheres have to land in a specified pattern to get you to the next level. Focos is at Van Beuningenstraat 40, 2582 KJ, The Hague, The Netherlands and *Mayhem* costs £10.

The other is *Switch* from Soft Rock Software in Bristol. *Switch* is a puzzle game resembling *Connect Four*. It costs £3.49 from Soft Rock Software, Freepost (BS7 978), Westbury-on-Trym, Bristol, BS10 7BR.

Meanwhile, progress on ambitious space game *Karma* has been hit by the death of one of the authors. Rick Delarre was tragically killed in a motorcycle accident last month. Co-author Ian Robinson says he intends to continue work on the game as a tribute to Rick. The two began work on *Karma* in 1988 and a preview version was released by Periscope Software over a year ago. The main release should follow within a year.

Finally, to mark the 10th anniversary of *Coin-Age*, if you buy a copy of *Paradroid 2000* direct from Coin-Age, before 10 June, you will also get a free copy of *Gribbly's Day Out*. In addition, you could win a lifetime's supply of free Coin-Age games.

CHEATS



'Shreeeech!' went Dominik Diamond's Elan as he completely totalled his third Lotus at the Acorn User Show. Meanwhile, his opponent raced ahead on Krisalis's *Lotus 2*. Dominik burned too much rubber to win but you could do better with a little help from Anthony (surname unknown for unknown reasons) from Grantham. Try these passwords: Dark Sky, Fogy Fog, Cactus or Damp Patch. This isn't the full set because you've got to find out something yourselves.



CHEQUERED FLAG
All right, don't be a lunatic Lotus abuser then, just stick to plain old racing simulation. *Chequered Flag* will run a lot faster on an Arm 2 machine (says 'The Bear' from St Albans) if racers turn off the speed display. You know when you're going too fast anyway because you usually spin out of control and die horribly. Switching out the mirrors helps too. If you go fast enough you won't need these either – all they'll show is dust.



Oh No! More Lemmings.
Oh yes, sadists. If you aren't satisfying your lust for lemming blood because of a few technical difficulties (you're completely stuck) then try this one simple password instead of any others: FIDDLECODE. This takes you onto the next level every time you whack the space bar during the game. Ruthless thanks go again to The Bear.

If you think that you have *even* more cheats than The Bear in St Albans, don't be shy. Send them to Games Cheats at the usual address.

HEIMDALL

Supplier: Krisalis
Tel: (0709) 372290
Machine: Risc OS
Price: £29.99

The bad news. I'd like to be able to say that role-playing games were now being converted to Acorn machines in droves. Sadly, it's not true. *Heimdall* is only the second RPG to appear on the Arc. The first was *Hero Quest.*

Given the intervening Christmas consumer boom (well, more of a fizzle. Thank you Mr Lamont) this is a shocking record. Software houses please note.

Good news. While *Hero Quest* was an entry-level game, heavily redolent of its board-based roots, *Heimdall* is a regular full-sized role player with a respectable air of size and complexity. It also, refreshingly, departs from the usual sword-and-sorcery formula of elves hacking and zapping their way through endless dungeons. Instead, we have a collection of Viking types, berserkers, warriors and the like, hacking and zapping...

The scenario is that Loki, the bad guy of Norse mythology, has stolen the weapons of the gods: Thor's hammer; Odin's sword; and Frey's Spear. These are hidden somewhere on the three levels of the game which in turn correspond to the three worlds of myth: Midgard, where men dwell; Utgard, the land of giants and Asgard, land of the gods. You have to find them.

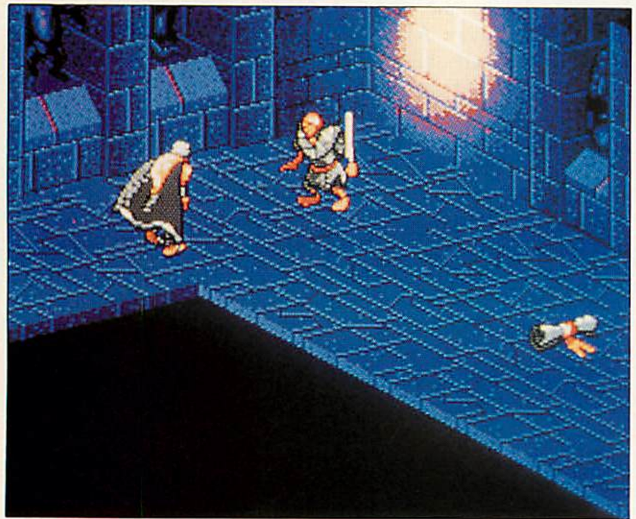
Before you start, however, there is an cute little interlude in which you get to play three small real-time games to help determine the composition of the crew. Eminently suited to the high cultural values of Vikingdom, these have you chasing pigs, throwing axes at the braids of tethered maidens (is this politically correct?) and hopping around the deck of a longship after treasure.

Fortunately for those, like myself, with naff reflexes, you don't have to do well at these to continue with the game. Either way, you can now select the six crew members of your longship from the variety of types available.

If you did do well at the sub-games, you get a slightly wider range of personnel to choose from. Characters have the usual sort of attributes for a standard RPG: strength, dexterity, stamina, luck, experience plus 'runelore', which corresponds to the usual wisdom or intelligence and means the ability to do magic. It's highly advisable to carry a spare magic user on the ship, but Heimdall, the leader, who must always travel on the ship is a potent magician himself.

The game proper offers you a map of the islands of Midgard which you can use to select your destination. Some islands are out of reach in one hop and have to be reached in stages. Once you have reached one, up to three of your crew can go ashore. Once ashore, you find yourself finally up against the real problems: the dungeons.


Heimdall: a full size respectable setting for the practice of magical arts


The magic sword of Odin lies hidden within one of three worlds

Dungeons are rendered in an isometric format, and you can move the character you are currently controlling around them. You can pick up objects by simply walking over them, or encounter the numerous animated characters by walking into them.

If one of the dungeon characters is a bad guy (usually the case) then you are faced with a combat screen. This shows an animation of your opponent, with a number of action icons surrounding it. By taking the opponent off-guard, which means watching their actions keenly and getting the timing right, you can do them damage, or alternatively you can block one of their blows. Magic can also be used to simply blow them away. The magic system in *Heimdall* is fairly rudimentary compared with RPGs from the *Ultima* tradition. Spells are simply scrolls found lying around the dungeons. Each can be used only once and cover options from zapping the enemy to healing your friends.

While the main puzzle component of the game is figuring out which key fits which door – the keys are distributed on islands all over the level – there are specific set pieces to solve. Usually, these take the form of figuring out a combination of switches which open a door or doors. One of the very first difficulties is locating the local supermarket to spend all that lovely gold by stocking up on supplies of food and armaments: getting to my local Safeway was never like this.

And that more or less sums it up. It is a 'meat and potatoes' sort of RPG. While the scenery and characters are nicely realised, there are few frills. The magic system is fairly rudimentary, the puzzles don't tax the brain too massively (which could be seen as an advantage by hack 'n' slay fans).

The combat routines, while graphically excellent, are quirky and unintuitive: after a while they become distinctly irritating. This is not unusual, though, in RPGs; almost every effort to add a real-time combat sequence to role-playing is going to seem unsatisfactory to someone. The exception is *Legend*, on the Amiga, where the action is completely integrated with the main game.

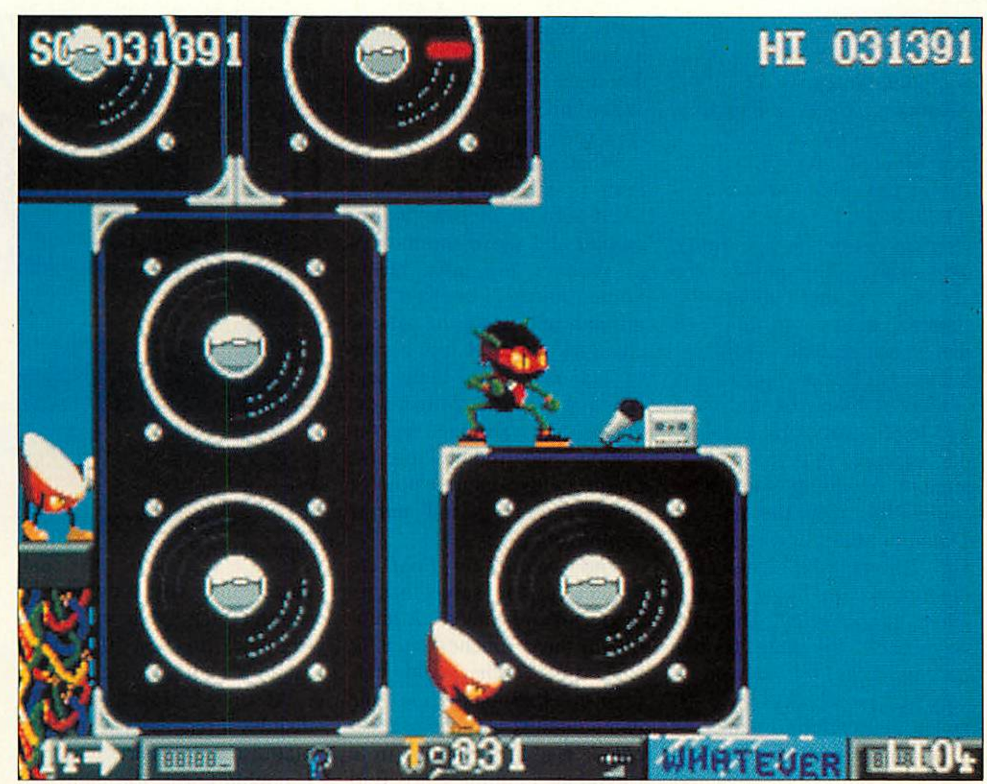
Nevertheless, I found I played *Heimdall* straight through to the end of the first level, at which point other commitments made me stop. So it's not too fancy, but there's enough here to keep the average role-player going for a long while. The game has one other thing in its favour: on the Arc it has no competition, none whatever. Lucky for *Heimdall*, but let's hope that this state of affairs doesn't last too long.

Fin Fahey



ZOOL

Supplier: Gremlin Graphics
Tel: (0742) 753423
Machines: 32-bit
Price: £25.99



As bad as Michael Jackson and a better mover too

Good news folks. *Sonic* mania may never have made it beyond the Sega console world but now Arc players have an equally cool alternative: *Zool*.

Zool is an intergalactic ninja and a happening one at that. He is small, cute and nimble, has a smooth black shell and spiky ears. There is no knowing exactly what sort of creature Zool is, for he also has green arms and legs and a thin pair of well-tucked-away wings. But small though he may be, afraid he is not. He can smash a bumble bee just by landing on its back. He can burst a killer drum with one punch of his paw. Zool is one of those ninjas who has come to expect anything.

He wrestles wobbling jellies, ducks bows from mutant violins and laughs in the face of flying peapods (though I probably would too). To the bystander, Zool has the courage of a lion and the agility of a cat. To Zool, ninja destruction is as easy as taking candy from a baby.

Just as well, really. Zool is heading home after a hard day's ninja-ing when his spaceship comes a cropper in a strange vortex. The intergalatic ninja of the nth dimension wakes to find himself stranded on Candyland, a weird planet made up entirely of sweets. His ship's computer says: 'You have been brought to this land as a challenge.' Then it says: 'Oh, by the way, the ship is damaged and will explode in seven seconds. Shutting down.' Zool exits the ship through the wall – but Candyland is waiting.

Zool is real arcade action stuff. Joystick (or keyboard) controlled, Zool runs, jumps, punches, crouches and can fire or kick at the baddies. He even skids to a halt if you try and turn him round quickly.

The little git is also a real poser. Slide him down an icing hill and he reckons he's some kind of megastar. Leave him still for a moment and he starts doing flash ninja manoeuvres. Occasionally he gets distracted by the background music and thinks he's a born-again Michael Jackson. The best is if you fire when Zool is midway through a jump: his wings sprout out and he spins super-fast, cutting the bad guys into tiny fragments as he moves.

The game scrolls horizontally and vertically and the platforms are made of Smarties and chocolate. There are three levels per world and each world has a different theme. The fearless fighter does battle with cymbals and huge speakers in a world made of headphones, CDs and keyboards; he confronts carrots and pomegranate volcanos in the fruit world; saws, chainsaws and driller killer in the tool world; tanks in the toy world; and makes enemies with toffee apples and popcorn bags in the world of the fairground. In each, Zool must collect enough objects (sweets, CDs) to exit the stage. And, before you leave, an end-of-level baddy avails itself for a good kicking. The graphics in *Zool* are stunning stuff and easygoing Zool will perform his mayhem to any type of music: rave, rock, funk, green – you choose. The hero's health is gauged by three red bars. When they go low, it's time to get collect some love hearts for an energy boost.

The game is easy – shoot the bad guys and collect the point-pushers to complete the levels – but there are loads of extras built-in. Apart from the usual power-up stuff (shield, super-jump, smart bomb) there are four hidden bonus levels, including a *Technodream*-style game, and crafty puzzles to solve. Look for smashable walls to find a colossal Polo mint on the first level and check the speakers that aren't speakers. One bit of advice: don't try the fast option until you know what you're doing. Even Zool gets dizzy when the world whizzes by like a video on fast forward.

Zool is Gremlin Graphics' first foray into the Acorn world and the company is on to a winner. *Zool* is cool. Get ninja-hooked today.

Sam Greenhill



Make an enemy of a grape today

FRED

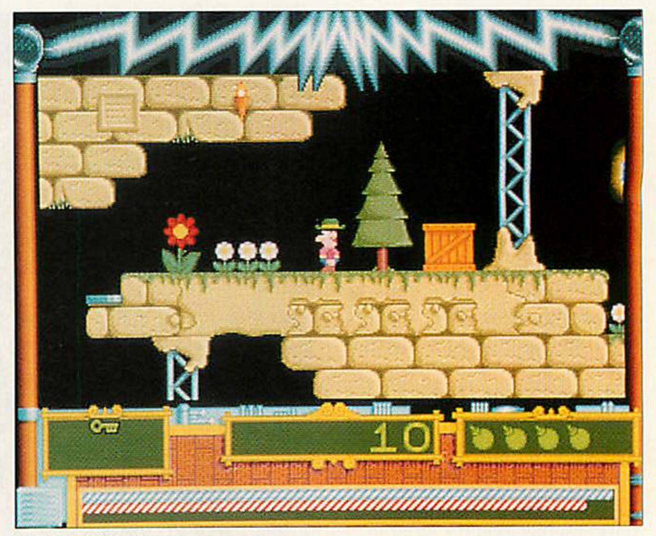
Supplier: Software 42
Address: 109 Ferry Road, Hullbridge, Essex
Machine: 32-bit
Price: £20

Original games are a rarity these days. Companies are always boasting about the 'latest parallax scrolling' or the 'most realistic graphics' but rarely offer new ideas.

Fred is based on the tried and tested platforms and ladders theme, but is a real attempt at doing something fresh. You play the part of Malcolm Maltezer (the chocolate being) who's had the misfortune of being turned into a human being. The only way back to your former cocoa-self is by solving a series of puzzles, set over 18 levels. As with most games of this type, *Fred* features a number of keys and bombs you must collect in order to open doors and remove walls. What's new though, is a laser beam that must be directed to a special box. When hit, this will open a door to the next level.

When you begin a level, the laser is off and you have a fixed amount of time to run around and move the mirrors to redirect the laser beam. Some mirrors are on the ground and easy to adjust: changing them is just a case of standing over them and pressing the Alter Mirror key. Others are positioned on the ceiling and require precise timing, with a combination of nimble jumping and mirror manouvering.

The graphics in *Fred* are perfect for the game: bright, colourful and smooth. A number of nice touches such as flickering torches and cartoonish lollipops give the game that extra ounce of cuteness. Baddies range from Egyptian mummies to Bart Simpsons, all of which run and hop around the levels trying to stop Malcom. The game comes with a number of sound effects. Malcom's footsteps are the best, if a trifle loud for such a little guy.



Right said Fred

At first, I was tempted to dismiss *Fred* as just another platform game, particularly as I couldn't get the hang of switching the mirrors. Once you can though, the game takes on a whole new perspective. The only drawback is that once you've completed all the levels, that's it. On the other hand this should take you some time, and it's worth £20 for the amount of fun that can be had.

Groovy graphics, spooky sound and chocolate; what more could you want?

Rob Miller

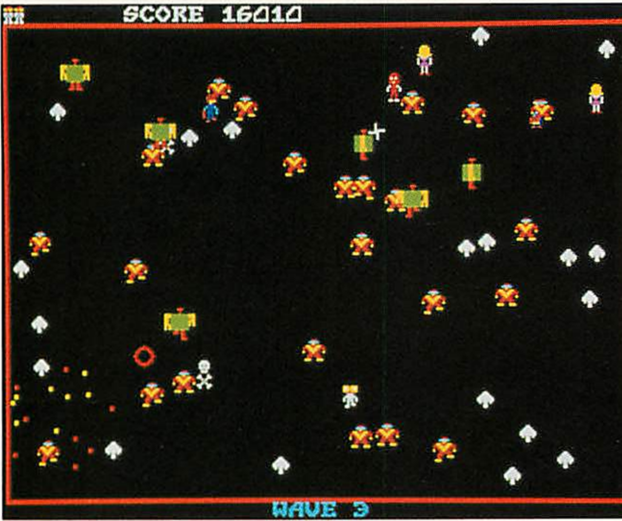
HUMANOIDS & ROBOTIX

Supplier: CIS
Tel: 071-226 3340
Machine: 32-bit
Price: £24.99

Cast your minds back (those of you who are old enough to remember) to the hazy days of 1983. The gentle sound of of *Pong* was just beginning to fade away and was being superseded by an exciting new craze: *Defender*. Yes, a state-of-the-art arcade game on state-of-the-art Beebs.

Of course, all that has changed now, and these days with no less than 32-bits at our disposal and goodness knows how many times the processing power we're all playing... *Defender*. Hmm. Something wrong? No, just another piece of rabid nostalgia.

Humanoids is (apart from some nifty samples) a rather shameless copy of Acornsoft's *Defender*. Don't get me wrong – I'm as big a fan of the game as the next man. As you zoom along the horizontally-scrolling mountains, rescuing the hapless little men who are repeatedly abducted by nasty greenies, the adrenalin pumps as in days of yore. But isn't the fact that we're still zooming along a full ten years later just a little sad?



The gaming days of yore recreated on the Arc

All the familiar enemies are here though. Baiters, swarmers, pods and mutants all conspire to make life difficult, and the urgent atmosphere is as strong as ever. This is the real thing, right down to the authentically chunky explosions. As the levels go by, it becomes much harder, and the pressure mounts.

If you've never played it (and I can't believe you haven't) you're in for a treat. The same is true of *Robotix*. Here is a classic game better known to most former Beebsters as *Robotron 2084* (originally by Atari) or one of its clones.

In this one a little robot has to run around avoiding other robots who are trying to close in on him. At the same time he must rescue wandering humans, avoid big dumb hulk robots, and shoot down obstacles – all this taking place at an ever increasing pace.

This is made fun to play by the fact that the robots are stupid and, if you circle them, they tend to bunch together like a herd of sheep, allowing you to blast them to tiny bits.

The Arc version has a novel touch. You control movement with the mouse, but firing is done with the cursors. *Robotix* becomes satisfyingly frantic but it was spoiled for me by graphics which look (and I mean this in the nicest possible way) as though they came from a Spectrum.

The trouble is that at £24.99 for two ideas of early eighties vintage, there's just not enough here.

Mat Tizard

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£15 STAR LETTER

I have been looking through recent *Acorn User* magazines, and I notice that you seem to be recommending the use of *Translator* by John Kortink.

However, I have yet to see a mention of *ChangeFSI* by Roger Wilson at Acorn, which is supplied on the Risc OS 3 Support Disc. Although I have not seen a recent version of *Translator* (the version I have is 6.80) *ChangeFSI* seems to have a much neater front end, better processing capabilities, and, what's more, it comes free with the operating system.

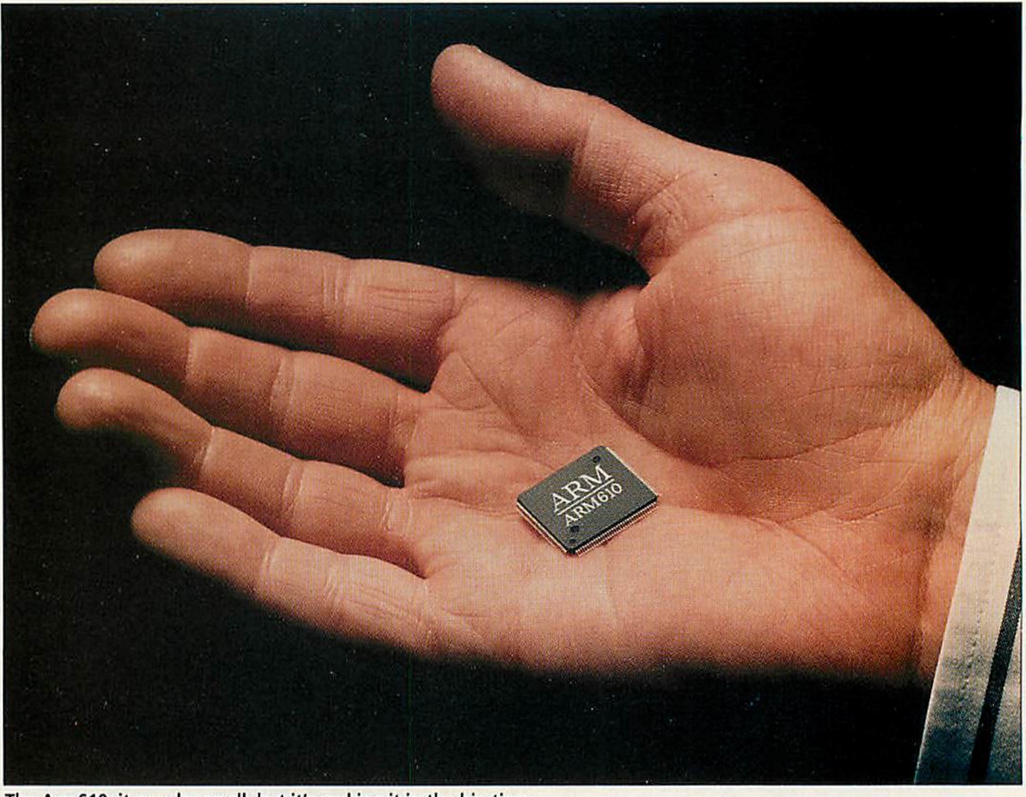
With *ChangeFSI*, it is also possible to process Windows BMP files, which answers a question posed in Questions & Answers in the February issue. Other formats recognised include JPEG, Clear, Tiff, Gif, and many other formats of which I have never heard. The only missing format from both programs (as far as I am aware) is support for X Windows bitmap files.

Also, in the November 1992 issue, you promised to review new CD-Rom discs. Judging by the adverts, there has been at least one new CD-Rom published, and yet there has been no review. I would also like to point out that there are many PC/Unix CD-Roms out there which contain C source code, perfect for all those little utilities you always wanted.

G Palmer
Aberdeenshire

We'll be taking a look at *ChangeFSI* and its image processing capabilities in an article soon. Bear in mind that *Translator* is a shareware product, so if you need to do a lot of file conversion or processing it's probably worth getting hold of both applications. One point which may be worth considering is that shareware authors do tend to take notice of bug reports and suggestions, and put out new versions constantly. A large company like Acorn can't do that quite so easily.

Our CD-Rom coverage continues on page 31 where we cover nature-based discs.



The Arm610: it may be small, but it's making it in the big time

PLAY IT AGAIN, ARM

I read with interest an article in last month's issue regarding the recently announced Interactive Multiplayer from 3DO. In the light of the recent focus on the huge revenues earned by Nintendo and Sega, the consumer games industry has attracted many would-be contenders eager for a slice of the cake – the most attractive being 3DO.

3DO has already signed up an impressive array of backers, developers and games programmers to enhance the credibility of its product. One item which the article omitted to mention is that 3DO has chosen the same Risc processor in its product as Acorn. Acorn users will be familiar with the same Arm Risc processor from Advanced Risc Machines Ltd, a variety of which, the Arm60, has been chosen as the CPU in the Interactive Multiplayer.

The endorsement of Arm technology by the 3DO consortium, including US giant AT&T, Matsushita and Electronic Arts, is just one of several developments in the international marketplace. Within the past six weeks, Arm has signed up the Sharp Corporation as a semiconductor partner, welcomed Nippon Investment and Finance on board as a new investor, and opened an Arm Tokyo office.

This is very encouraging news from a technology developed in Acorn's R&D labs. Watch the news for Arm-powered developments.

P Magowan
Arm Ltd

Not only are programmers being wooed by the technology of the 3DO console, but the games market is taking notice.

This is potentially very good news for the Acorn market, since sharing a chip could mean that we will share the resulting software. Watch this space for more details.

DISCY BUSINESS

I have just received my latest *Acorn User* and 3.5in disc. I would like to compliment you on the very easy-to-use menu system: the disc now compares to other magazine's cover discs. It was an excellent idea to include the help button, as it was always a nuisance to have to keep looking up the details in the magazine.

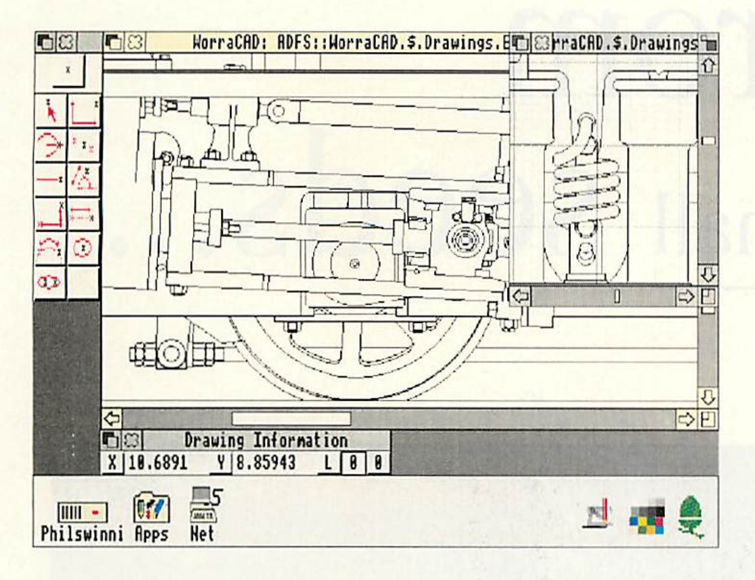
One thing that I do wonder about, though, is the amount of material on the disc. Having put the items from the magazine on the disc, there seems to be very little free space for extra items; witness the May issue, where there were no real bonuses at all. Are you going to feature bonus items regularly, or is the magazine disc simply a carrier for the yellow pages, with a souped-up front end?

R Cleves
Norfolk

With this issue of *Acorn User* we have taken a few important steps to improve our free disc even further.

From now on, each application on the disc is compressed using ArcFS 2 from Software 42, thus making the effective capacity of the disc much higher. Also, we will be concentrating on obtaining high quality bonus items, be they demos, applications, artwork and so on. If anyone has anything they think may be suitable for publication on the disc, please do send it in.

Technical Drawing for RISC OS



Launched in 1990, WorraCAD was the first CAD system for RISC OS. After three years of continual refinement, the application has matured into a product essential to anyone creating technical drawings on the Archimedes.

WorraCAD is a 2D technical drawing application for the Archimedes desktop. It has been designed to be a truly practical tool, ideally suited to dealing with the everyday problems associated with precision 2D draughting.

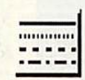
WorraCAD is unique amongst CAD applications for RISC OS in that it uses a floating point, rather than an integer model to represent its data internally. This avoids major problems with respect to accuracy and maximum drawing area. Highly optimised code ensures speedy performance in spite of the extra calculations required.

WorraCAD has seen many improvements over its lifetime, and most recently, has benefited from the addition of ellipses and elliptic arc geometry, and a complete revision of the user interface which is now totally icon driven (although the earlier interface is retained as an option for those who prefer it).

In spite of recent major improvements, WorraCAD's price remains at a very competitive £99.00. Education price is £69.95, and a site licence costs £279.80 (excludes p&p and VAT).



WorraCAD can output files in a wide variety of formats. Drawfiles can be transferred to almost all other Archimedes graphics packages. DXF and HPGL files cater for industry standards.



Technical drawings require the use of different linestyles to show hidden detail, centre lines and so on. WorraCAD provides a range of styles to cover virtually all requirements.



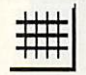
The greatest strength of WorraCAD is its ability to calculate tricky geometric constructions automatically. Tangents, normals, foci and so on can be generated simply by clicking the mouse.



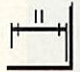
One of the most time consuming tasks at the drawing board is that of hatching. With WorraCAD, you simply select the boundary and any islands to be hatched, click, and the job's done.



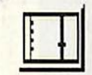
WorraCAD allows virtually unlimited scope for zooming in and out. Because of WorraCAD's unrivalled accuracy, even at 500 000 x magnification, the drawing still hangs together.



The grid system in WorraCAD can be set to display in either orthogonal or isometric modes. The vertical and horizontal spacing can be independently adjusted.



Comprehensive dimensioning to BS308 is provided. Dimensions are associative - if the drawing is stretched, the dimension adjusts automatically. Precision and dimension style are easily controlled.



Plotter output is provided using the HPGL format, the industry standard plotter control language. Output can be sent directly to the plotter, or to file for plotting later, perhaps via a bureau.



Printer output goes via the standard RISC OS printer drivers. A preview mode is available, and a monochrome option is provided for output of coloured drawings to monochrome printers.

Move up to WorraCAD and draw your own conclusions



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HANDS ON
Practical advice and techniques for your machine
THIS MONTH:
● A complete rendering program
● Questions and answers
● 3D programming
● Star Info
● Hints and tips
● Assembly language round-up
● Program listings



HANDS ON

Hello, good evening and welcome to the new Hands On section. This part of the magazine is dedicated to all those who want to understand more about their machine, and want to know why things happen the way they do. Programs, hints and tips, *INFO, Questions & Answers: they're all in here.

This month kicks off with a complete rendering package which can produce some truly spectacular results. The code is so long we can't list it in the magazine, but if you need one good reason to get the subscribers' disc, this is it. Take a look at the examples on this page; they're all produced by describing a scene in a simple script language, and letting *Render* do the hard work.

Continuing with the theme of graphics, Dave Acton presents the first part of a series on displaying 3D scenes. These articles will provide programs and tools to enable you to build up 3D objects and worlds, and will even allow you to make 3D animations.

Yet another new section is Hints and Tips, your indispensable guide to a better computing life. This is where you get the chance to share those vital titbits of information which make using the Arc that little bit smoother. If you've got anything you'd like to share with the rest of the world, drop us a line.

As if all this wasn't enough, Questions & Answers aims to solve all your problems and more, and *INFO continues to prove there's more to life than 9 to 5.

So go on, get stuck in and get your hands dirty.

Mark Moxon
Technical Editor

GRAPHICS RENDERED SIMPLE

Rendering is a vital aid to producing lifelike graphics. Robin Barnes shows how you can achieve amazing results without time-consuming ray tracing

It seems computer programming, like everything else, has fashions. A few years ago no respectable computer was without a suite of Mandelbrot generators; since then Cellular Automata have grown and died.

Recently, with full-colour, high-resolution graphics becoming commonplace, interest has grown in rendering algorithms.

A rendering algorithm constructs a realistic picture from simple data describing the nature of the scene. The most common algorithm is the ray tracer, which laboriously traces each light ray back from the observer.

Although the results are very good, the amount of processing involved is prohibitive; a single frame can take many hours to produce. For most images ray tracing isn't needed; most computer graphics research is devoted to finding simple, fast algorithms that can fool the eye into believing the image is real.

Render is just such a program. It takes a scene described by its own language and produces a sprite in a fraction of the time a ray tracer would require. On average, a single frame containing several thousand polygons is produced in twenty minutes. *Render* can cope with multiple light sources and multiple material descriptions. It incorporates Phong shading for curved surfaces and can texture map sprites over groups of polygons.

The main routines for rendering are written in machine code and use single precision floating point arithmetic throughout. The program is split in two: a compiler that translates a scene into raw data, and a renderer that produces the output sprite.

The scene is described by a textfile written in the script language; this is reduced by the compiler to a list of points and polygons that can be manipulated much faster by the machine code. The renderer produces 256-colour sprites and uses a colour stippling routine to extend the apparent palette.

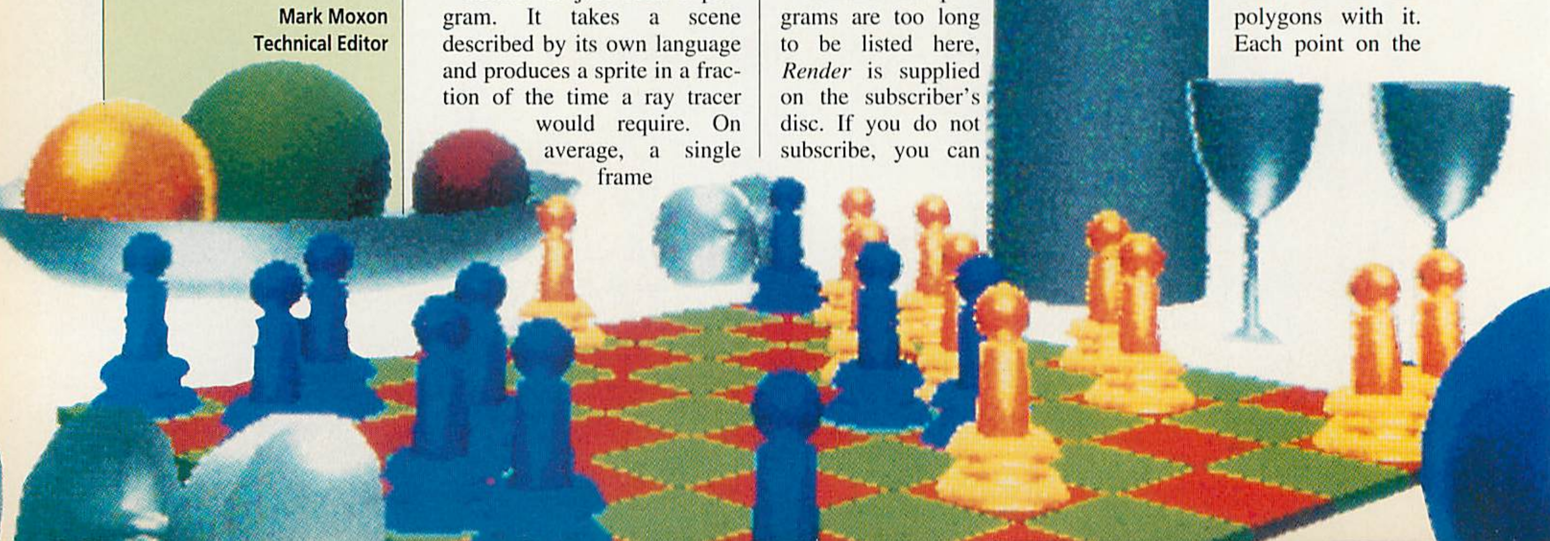
Because the programs are too long to be listed here, *Render* is supplied on the subscriber's disc. If you do not subscribe, you can still get the disc: see page 73 for details. Full instructions on how to use the application are on the disc.

THE ALGORITHM

A rendering algorithm must convert a set of three-dimensional points and polygons into a two-dimensional image. To do this the routine must calculate which polygons are obscured by others closer to the observer. It must also calculate the colouring of those that are in view.

A number of standard methods have been developed over the years, the most powerful being the scan line technique. This involves scanning across each of the lines of the screen to find the intersections of that line with polygons.

Render uses a derivative of this algorithm known as the spanning scan line. A list is constructed for each scan line containing the intersections of all the polygons with it. Each point on the



line is then checked against this list to discover which polygons it lies within. The relative depths of the intersected polygons are then compared, to find the one closest to the observer.

Having found the polygon in view and the position of the point within it, it only remains to find its colour. This is done using an illumination model applying the laws of optics. The model calculates the intensity and colour of the point using the incident light and the material properties of its surface.

Render uses a very simple model. White light from an infinite distance strikes the surface of the material. Some is absorbed, then re-emitted as randomly-scattered light in a process known as diffuse reflection. The remainder is reflected at the surface by specular reflection.

The intensity of this diffuse reflection is determined by the angle at which the light strikes a polygon, measured relative to the normal or perpendicular to the surface. The intensity of specular light is determined by the angle between the light reflected from the surface and the line of sight of the observer.

This simple model can only cope with a flat surface whose normal is constant at all points across it. A curved surface, by its very nature, has a normal that will continuously change in direction.

Render incorporates a solution to this problem, available to scan line algorithms, called Phong shading. As the position within the polygon is already known, and assuming the normals at vertices can be found, it is possible to interpolate between them to find the normal at any point. The resultant difference to the final rendering is quite striking.

Render uses a number of separate machine code routines to perform all the necessary calculations. A number of preliminary calculations are first performed to speed up the final rendering.

The points are transformed according to the view point of the observer, the plane equations for the polygons are calculated and from these the normals at all points can be derived. Finally, perspective is applied and the boundaries of the polygons are found.

The scan conversion can now take place; a list of intersections is formed at the start of each scan line and every point along the line is tested in turn. Information is then returned about which polygon is in view; the interpolated normal (if the polygon is curved); where the polygon was intersected; and which points within it border the intersection.

The normal is then fed to the illumination model, which returns the red, green and blue intensity of the light. This is converted to the 256-colour palette by scaling to 24-bit and subsequently to eight-bit colour. Finally, a small error is applied to give the appearance of there being more colours on the screen.

CONCLUSIONS

The program started out as a comparatively simple idea for a rendering algorithm and has since snowballed into a major project. Along the way, the script language has, to an extent, become the more important result.

The rendering algorithm still has some room for improvement: the lighting model is, for example, rather simple and does not include point light sources or shadows, and the reflection model is also rather primitive.

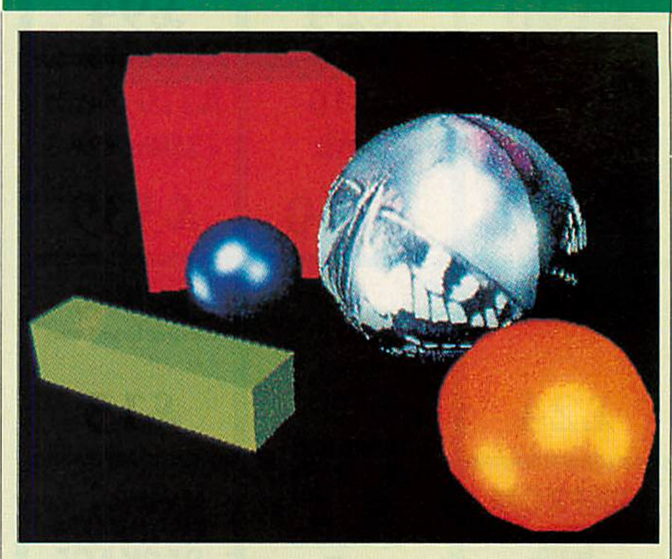
The language and the compiler, however, could be coupled to a more powerful algorithm, such as a ray tracer. You could then use it to form the basis of a powerful graphics tool. Despite the limitations, I am sure you will find the final results worth the effort.

REFERENCES

Some useful background reading on the subject can be found in *Procedural Elements for Computer Graphics* by David F Rogers.

For those who would like to become more involved in ray tracing and rendering, and want to try a professional application, check out *Illusionist* and *Render Bender*. These are both available from Clares, telephone (0606) 48511.

THE SPRITE LANGUAGE



Scenes are described in a script language, designed to be as flexible as possible without being unnecessarily complicated. There are no line numbers, variables or control structures, and few commands. Despite this, complicated images can be generated by comparatively simple programs or scripts.

An example script is shown below, and the scene it describes is above. The sections of script are easy to follow. First the materials to be used are defined. Then comes the longest definition, that of a sphere, then the cube definition.

The scene itself is then described. This consists of a sphere with a sprite mapped onto it, then a red cube, a green cube, a gold sphere and a plastic sphere. All that remains is to describe the resolution and filename of the output, and to define the positions of the observer and the light source. You will find full instructions on the disc.

```
material {0 ,0,0.2    0.8,0.8,0.8  10
red      0.4,0,0    0.6,0,0      4
green    0,0.4,0    0,0.6,0      4
gold     0.8,0.1,0  0.6,0.4,0.1  10
}

define {shape { 12  0,COS(PI*1/11),0   -SIN(PI*1/11),0,0   0,0,-SIN(PI*1/11)}
shape {12 0,COS(PI*2/11),0   -SIN(PI*2/11),0,0   0,0,-SIN(PI*2/11)}
shape {12 0,COS(PI*3/11),0   -SIN(PI*3/11),0,0   0,0,-SIN(PI*3/11)}
shape {12 0,COS(PI*4/11),0   -SIN(PI*4/11),0,0   0,0,-SIN(PI*4/11)}
shape {12 0,COS(PI*5/11),0   -SIN(PI*5/11),0,0   0,0,-SIN(PI*5/11)}
shape {12 0,COS(PI*6/11),0   -SIN(PI*6/11),0,0   0,0,-SIN(PI*6/11)}
shape {12 0,COS(PI*7/11),0   -SIN(PI*7/11),0,0   0,0,-SIN(PI*7/11)}
shape {12 0,COS(PI*8/11),0   -SIN(PI*8/11),0,0   0,0,-SIN(PI*8/11)}
shape {12 0,COS(PI*9/11),0   -SIN(PI*9/11),0,0   0,0,-SIN(PI*9/11)}
shape {12 0,COS(PI*10/11),0  -SIN(PI*10/11),0,0  0,0,-SIN(PI*10/11)}

point {0 ,1,0}
point {0 ,-1,0}

surface {0 12,10  TRUE,FALSE}
link {0 ,11,120} link {11 ,10,120} link {10 ,9,120}
link {9 ,8,120}  link {8 ,7,120}   link {7 ,6,120}
link {6 ,5,120}  link {5 ,4,120}   link {4 ,3,120}
link {3 ,2,120}  link {2 ,1,120}   link {1 ,0,120}

link {108 ,109,121} link {109 ,110,121} link {110 ,111,121}
link {111 ,112,121} link {112 ,113,121} link {113 ,114,121}
link {114 ,115,121} link {115 ,116,121} link {116 ,117,121}
link {117 ,118,121} link {118 ,119,121} link {119 ,108,121}
}

define {point { -1,1,-1  1,1,-1  1,-1,-1  -1,-1,-1
        -1,1,1   1,1,1,  1,-1,1,  -1,-1,1   }

link {0 ,1,2,3} link {1 ,5,6,2} link {5 ,4,7,6}
link {4 ,0,3,7} link {4 ,5,1,0} link {6 ,7,3,2}
}

sphere {0 ,1,0

texture {0 .4,0.6,15

fit {12 ,10}
map {0 .5,1}
map {0 .5,0}
}

}

cube {- 3,1,0.25         red     rotate {0 ,60,0} }
cube {- 1,0.25,-2       green   scale {1 ,0.25,0.25} rotate {0 ,20,0} }
sphere {1 .5,0.6,-1     gold    scale {0 .6,0.6,0.6} }
sphere {- 1.5,0.5,-0.8  plastic scale {0 .5,0.5,0.5} }

display {1024 ,1024 medium 1280,1024}

view {3 ,3,-4  25,-45,0}

light {160 ,40  210,-20  140,60 90,20}
```

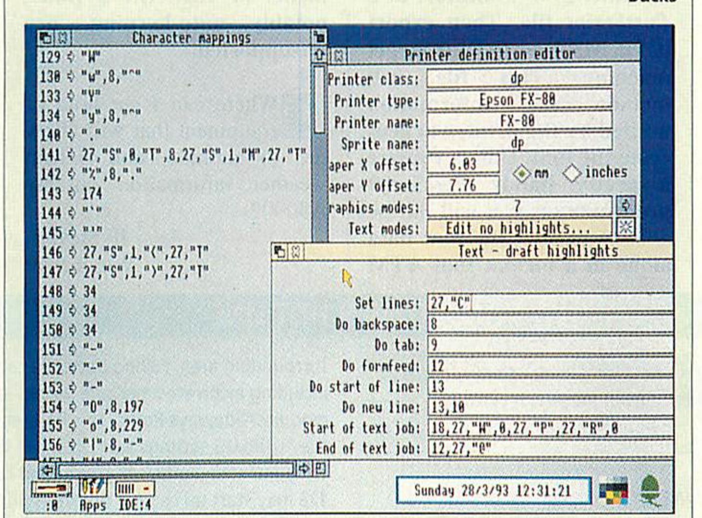


QUESTIONS AND ANSWERS

STAR QUESTION

Q I have an A3000 with Risc OS 3.1 and a Panasonic KX-P1180 (Epson FX-compatible) printer. When I had Risc OS 2, I often sent control codes to my printer within *Edit* documents using the printer driver PrinterDM. Since I upgraded to Risc OS 3.1, the new printer driver does not appear to recognise these codes despite my experiments with different configurations. To overcome this, I've fallen back on printing such documents using the old printer driver. I would appreciate any advice.

J Tarrant
Bucks



PrintEdit is one way to deal with escape sequences

A Try this. Call up a bit image printer configuration window by selecting your printer in the Print Manager, then choosing Configure from the menu. If the text quality option is set to no highlights and the control codes option says standard, your files should print as they did under Risc OS2.

Alternatively, you could use *PrintEdit*, shown above, to map some of your escape sequences to characters with high Ascii values. This effectively creates single highlight characters which are then expanded into control codes at print time.

Q I have a 4Mb Archimedes 310 which I use with Clares *Rhapsody* for Midi music. Recently, I was given an MS-Dos demo disc containing Midi files that I wanted to use on my computer. I copied these across to an Archimedes disc using *MultiFS*, but when I tried to load them into *Rhapsody*, I got a message saying '*Rhapsody*, Midi or *Maestro* files only please' and could get no further. Have I got the wrong sort of Midi file, or am I doing something wrong?

M Connolly
Norwich

A It's true that Standard Midi Files (SMFs) do come in three types (0, 1 and 2) but the vast majority of commercial songfiles are of type one and therefore compatible with *Rhapsody*. My guess is that the file you are trying to load still has its filetype set to Dos, as opposed to Midi, and this is what prevents *Rhapsody* from loading it.

To fix this, press F12 for the command line and if, for example, your SMF is called Fred/Mid, type *SETTYPE FRED/MID FD4 and press RETURN. This changes the filetype to the hexadecimal number FD4 denoting a type one Midi file.

If *Rhapsody* is already installed, the file icon will change from the MultiFS Dos image to a Midi icon. Once this has happened, you can drag the file into *Rhapsody* and it should start to load. Standard Midi files take some time to convert, so it's probably worth saving a new version in *Rhapsody* format as soon as loading is complete.

Q I bought a BBC Microcomputer several years ago which my family have used more as a games machine than anything else. Recently, I have been using a personal computer at work and am now interested in using my micro for business both as a word processor and a spreadsheet. Is it possible to update my computer and, if so, what will I need to buy? Would I be better off starting from scratch? Naturally, I want to end up with a reasonably-equipped system but cost is also a consideration. My computer is a BBC B with a cassette player and a black-and-white monitor.

J Dunn
Ipswich

A Yes, this is possible. You'll need a word processor and a spreadsheet program on Rom chips; these will plug easily into your computer. You could have a look at Computer Concepts' *Inter-Word* and *Inter-Sheet* or Acorn's *View* and *ViewSheet* packages. These cost between £70 and £80 excluding VAT and will meet your basic needs but it is unlikely that you will be comfortable with them alone. The slow speed of a cassette is just about acceptable when you want to load one game and play solidly for two hours. However this storage speed becomes very tedious when it comes to saving word processor documents every 15 minutes.

To make the setup usable you will also need to invest in a 5.25in disc drive (minimum £70 plus VAT) and the DFS kit that upgrades your Beeb to talk to it (about £45 plus VAT). Once you throw in a cheap dot matrix printer you're looking at about £350.

If your home office needs are fairly modest this setup may be sufficient. However, if the personal computers you use at work are PCs, equipped with serious business software, you'll probably be unimpressed by the results. With the best will in the world, a BBC Micro will never offer the facilities available in *WordPerfect*, *Word for Windows*, *Excel* or *Lotus 1-2-3*. However a Risc based Acorn machine certainly can.

My advice is to find someone in your area who can show you a BBC B running the software I've suggested and, if it doesn't meet your needs, put your £350 towards an A3020 *Learning Curve* or even an A4000 *Home Office*. Both packages come with a word processor and can write to MS-Dos discs so you might forestall the purchase of a printer by taking Ascii and CSV files into work and printing them there.

Q Having typed in the six *Bio* programs in the February issue of *Acorn User*, I experienced difficulty with *Bio1* starting at line 1690. Is there a means by which I can move through a Basic program on my A540, a step at a time?

B Boswell
Radlett

A This is called line tracing. You need the Basic keyword TRACE. The two options you're most likely to want are TRACE ON and TRACE STEP ON. TRACE ON causes Basic to print every line number it meets as it

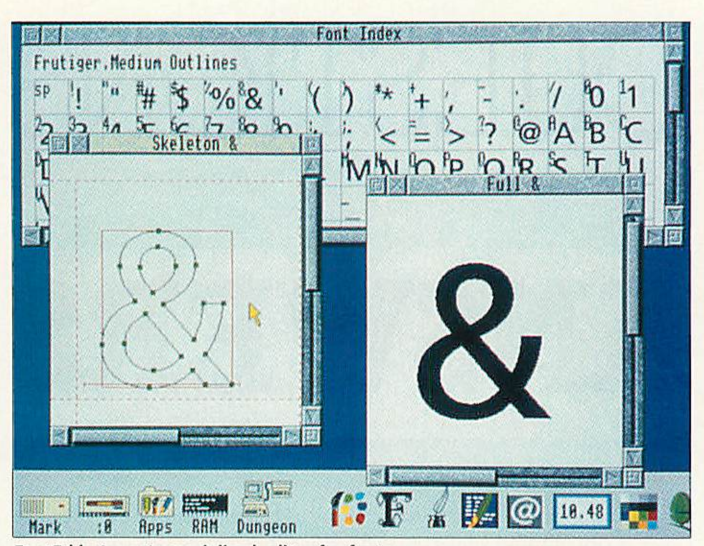
interprets the program. TRACE STEP ON does the same, but pauses for a keypress between lines. When you've debugged the program, TRACE OFF deactivates either function.

Q I recently upgraded my A440/1 to Risc OS 3 and am very pleased with the new operating system. On the support disc which came with it, there is an application for converting *Adobe Type Manager* (*ATM*) outline fonts from a PC to Risc OS format. I have several hundred Risc OS fonts which I would like to convert to *ATM*. Is there any way I can do this using *T1ToFont* and, if not, what software do I need? Also, is there a version of *FontEd* for Risc OS 3 and how could I obtain a copy?

C Archer
Bangor, Co. Down

A As far as I know, the only programs to convert Risc OS fonts to Type 1 *PostScript* are in-house utilities written by font manufacturers and are not available either commercially or in the public domain. If you need to print documents containing Risc OS fonts to a *PostScript* printer connected to a PC or a Macintosh, the following is one option.

First print your *Impression* document, or whatever, to a *PostScript* file. Then export it, via MS-Dos, to your target machine. This file will include the information needed by the printer to generate the font. Unless you are a pretty handy *PostScript* programmer, you will not be able to extract the font data alone in a format that ATM will recognise. You can get the current version of *FontED* from Acorn, on (0223) 254254. At time of writing, though, some elements of Risc OS 3 fonts, notably auto-kerning, are unsupported.



FontEd is Acorn's specialised editor for fonts

Q Where can I get hold of equipment that will allow me to monitor and collect weather information on my A3000?

JF Stevens
Winchester

A If you want an automatic weather station that records things like sunlight, humidity, windspeed, rainfall and so on, have a look at *The Weather Reporter* made by AU Enterprises on (0707) 266714. If, on the other hand, you're interested in satellite data systems, talk to Spacetech on (0305) 822753.

Q I own an Archimedes and would like to purchase a copy of *Tetris* to play on it. I have heard that there are versions available in the public domain. Please can you tell me which public domain houses sell it?

M Turner
Thirsk, North Yorkshire

A There are numerous *Tetris*-type programs in public domain and opinions differ as to which is the best.

This being the case, Arch Angel PD, PO Box 41, Exeter, EX4 3EN has put together a mini-compilation of the best seven versions, all compressed onto one disc under ArcFS. A copy will cost you the princely sum of £2.00.

CUSTOMER HOT LINE



Each month in Acorn User, Alan Glover offers you the latest support and advice from the Acorn customer service department.

COMPUTERS WITH AMNESIA?

All Acorn computers since the Master 128 have relied upon configuration settings which are stored in a memory device that has a constant power supply, even when the computer is switched off. This is usually, though incorrectly, referred to as Cmos Ram.

With the exception of the Master Compact, the power to maintain the settings (and the real-time clock) comes from batteries inside the computer. The Master Compact used a device called an EEProm (an Electrically Erasable Programmable Read-Only Memory) which did not need a battery, but only allowed a limited number of write operations. Where a Master Compact is failing to retain its settings this device may need replacing.

On most Arm-based 32-bit systems the battery is a NiCad (Nickel Cadmium) cell, which is trickle-charged while the computer is switched on. This means that, after a machine has been left unused for a long period, it may need to be left on for several hours to recharge the battery. These batteries should not need replacing.

The Master 128, Archimedes 305/310, Archimedes 440 and Archimedes 400/1 series all use a battery pack with conventional battery cells. The recommended replacement interval for these batteries is annually, however they will often work for much longer. Even now, it is not uncommon to see a 305/310 still on its original pair of batteries.

As with all devices powered by batteries you should replace them at recommended intervals, and avoid leaving discharged batteries in place since corrosive substances may leak from the battery and damage the surrounding area. Failing batteries can produce many strange symptoms, including incorrect time/date values and the random disabling of modules/sideways Roms. This happens when the locations used to hold the *UNPLUG settings vary, because the battery can no longer consistently maintain sufficient power and can cause some odd errors: a Master 128 may start up using a different filing system to normal, or a Risc OS computer may fail to start up the desktop.

It could be time to think back and ask yourself, when were your batteries last changed?

ETHERNET-BASED AUN NETWORKS

If you are getting poor performance from an AUN network you should check whether the Broadcast Loader is enabled on any Ethernet-based stations. The Broadcast Loader should be disabled in these circumstances using *Unplug BroadcastLoader in a boot sequence.

FREE LOADER

The filetype system employed in Risc OS can be used to save memory and automatically load specific applications as required.

You do not, for example, have to have *Edit* loaded at all times to be able to double-click on a text file. Ensure that *Edit* has been seen in a directory viewer before you double-click on a file which can be handled by that application. That way, the application will be loaded when it is needed. There are some side effects: if a file does not have its usual icon, but has a blank square instead , the application has not been located yet in a directory viewer.

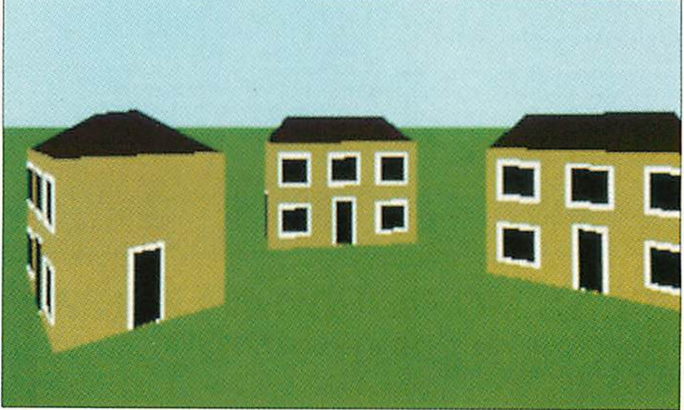
There are also some filetypes allocated to generic files, such as CSV (comma separated value), often used for interchanging data between applications. Because these are general files, they should not be specifically claimed by any particular application.

A NEW DIMENSION

You don't see the real world in two dimensions, so why settle for it on your screen? Dave Acton talks you through part one of our 3D tutorial

The challenge of turning a flat monitor screen into a window on a three-dimensional world has fascinated programmers for years. Whether you're designing a new car, learning how to land an Airbus or simply trying to shoot a few aliens, having that extra dimension makes all the difference.

This series is all about 3D graphics on your Acorn 32-bit machine. We'll kick off with a Basic demo to tickle your fancy and show how simple the idea is. The demo is on the monthly disc and in the yellow pages. Over the next months we'll provide a module for faster 3D graphics, a designer for 3D objects and worlds and finish with 3D animation.



The program lets you see the houses in 3D and move around them 360°

FUNDAMENTALS

The idea behind 3D graphics is simple. Just as points on a flat screen have two co-ordinates (x and y) points in the 3D world have three (x, y and z). An object's z co-ordinate can be thought of as how far it is *into* the screen. In the real world, it's just the distance an object is from your eye when you're looking straight at it.

Because a monitor is 2D, not 3D, we need to convert 3D co-ordinates into 2D ones before we can display them. We could simply ignore the z co-ordinate, but the effect would be very unrealistic. We need to take account of perspective. Put simply, this is the property that makes objects appear smaller the further they are from the eye. The perspective transformation is the process by which 3D co-ordinates are converted into 2D ones. These represent, as realistically as possible, the 3D world on your flat screen.

SENSE OF PERSPECTIVE

Many 3D textbooks are filled with line drawings to explain the idea of the perspective transformation but, because books are no more 3D in their nature than screens, such diagrams often confuse more than clarify. Best then, I think, to picture in your mind what is going on.

Imagine standing in front of a house. In fact, go outside and have a look at your own. Imagine you can see through it. The rear wall – although its x and y dimensions are the same as the front wall – appears much smaller than the front wall. Its z co-ordinate is bigger.

Therefore, if you were to attempt to draw your house on the screen it would make sense to divide the x and y co-ordinates of each wall by their z co-ordinate in some way.

In this way, the further away something is, the bigger the z co-ordinate and the more the object would be scaled down. This is all there is to the perspective transformation. The x and y co-ordinates of an object are divided by their z co-ordinate and multiplied by some suitable scaling factor so they fit comfortably on the screen.

At this point it is as well to remember that 3D vision is somewhat arbitrary. That is, despite all the diagrams and formulae you may come across in weighty tomes, the way we see the world in 3D is peculiar to humans. Fish and birds see a different picture, and as for flies – well, I'd hate to write a CAD package for flies to use.

We don't see a nice rectangular section of the world – things in front of us are sharper than those at the side – and our brains sort out all the information, so we get an apparently seamless view.

Therefore, whatever we do, we will never manage to fully convince someone that what is behind the monitor is actually real. All we can hope for is to give the best approximation of reality we can.

IMAGINARY WORLDS

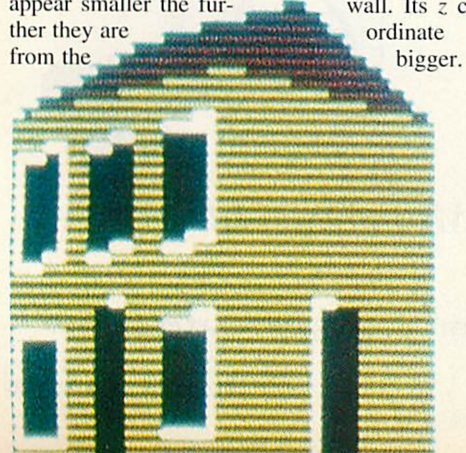
Having found a good representation of the 3D world, we now have to consider how our imaginary world is to be defined and stored. The practicalities of managing an imaginary world throw up many problems.

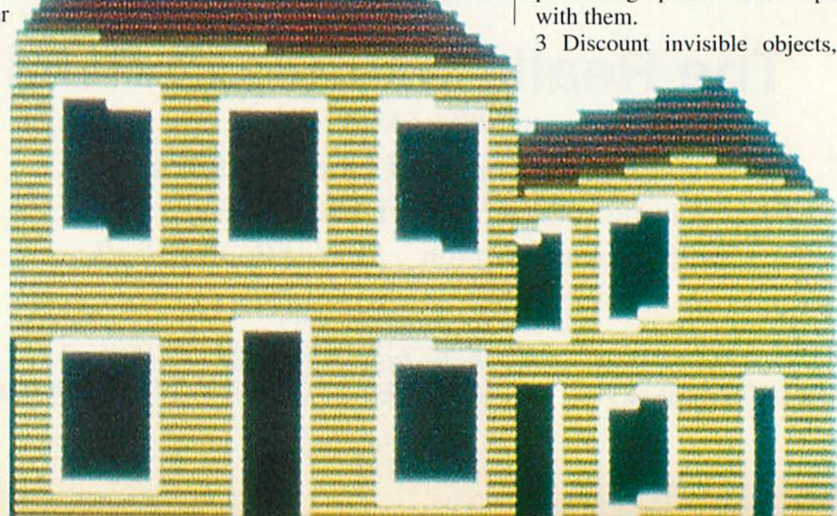
The real world is made up of countless objects – imagine how long it would take to plot a field of grass on the screen if each blade had to be considered individually. In defining our world, we therefore have to keep three points in mind at all times:

1 Ensure that the total number of objects is kept to a minimum.

2 Keep object definitions simple enough so the available processing power can cope with them.

3 Discount invisible objects,

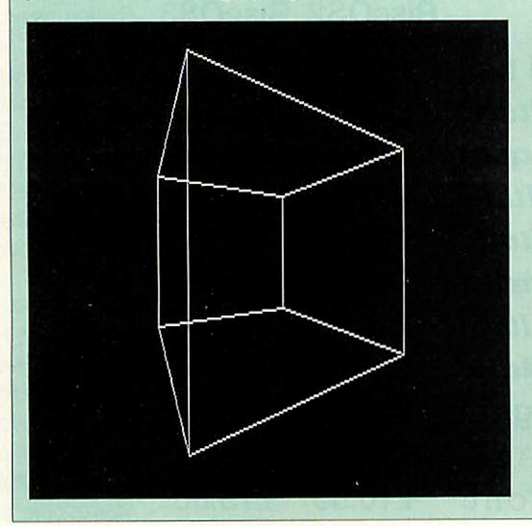


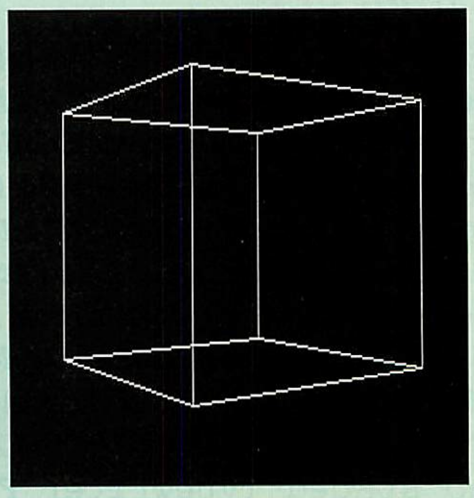


PUT THINGS IN PERSPECTIVE

The short program PerspDemo illustrates how perspective can be made 'wild' or 'tame'; the choice depends on the type of program you are writing. Two factors in the program are changeable: d and zoff. The d factor is simply the scaling factor we talked about earlier on. Meanwhile, zoff is an offset in the z direction and represents how far back you are standing to view your 3D world.

Run PerspDemo and move the mouse left or right to change the value of d; up and down to alter zoff. Now move the mouse towards the left and then up or down until the rotating cube is clearly visible. Here the perspective is exaggerated. It's just like looking through a fish-eye lens from close-up. Now move the mouse to the right and then up or down again until the cube fits comfortably on the screen. The perspective here is much toned down. We have put down our fish-eye lens, taken a good few steps back and are now looking at the cube through binoculars. As you can see, by altering just these two values, a great variety of 3D images can be produced and it is really up to you to tweak the numbers to best suit your application.





such as those 'behind' us, as early as possible.

BUILDING BLOCKS

Consider the problem of defining and displaying an imaginary street. You could break the whole street down into triangles (bits of roof, wall, window and pavement). This would give you thousands, possibly millions, of these little triangles.

Then you could plot these, rearmost first, to give the picture. This would work, but would take a great deal of effort both to set up the data and process it.

Better by far to use an object-oriented approach. You might tackle the problem thus. First, define a window; then define a door; define a blank wall and add windows and doors to it; define a house as four walls plus a roof; define a pavement and a road; finally, define a street as a set of houses ranged around a pavement and road.

By defining simple objects and using them as building blocks to create more complicated ones we both simplify the definition stage and make life easier when it comes to plotting the scene. If a house is invisible to us, we shouldn't worry about each pane of glass in its windows, but should discount it immediately. The building block technique makes it easier to ignore irrelevant parts of the scene.

A DEMONSTRATION

And so to our short demonstration, which you will find in the yellow pages. There are, in fact, two demonstrations: *3Ddemo1* and the slightly faster *3Ddemo2*. These build up into a short sequence of frames (36 in all) which are played back repeatedly. You are then taken on a flight around the group of houses.

Both demos require the Basic library *3Dprocs*. The definitions for our 3D world take the form of two text files, *House* and *World1*, which should be entered using *Edit* and saved in a subdirectory called *Objects*. The format of the files should be fairly obvious. Special keywords are used in the definition of objects:

rem introduces a comment.

colour defines the colour of the following surface (red, green and blue).

object begins the definition of a new object. The special object 'world' must be present and this is the one that the demonstration shows.

surface introduces a new surface. A surface is simply a list of three or more points, defined with *x*, *y* and *z* co-ordinates. For example, a door is made up of a black rectangle on top of a white one.

include is used to include a named definition file at that point. The file *World1* includes the file *House* and then defines the object world as three houses.

xxx includes object *xxx* in a definition. So a wall contains windows and a door. The object name is followed by six numbers: *x*, *y* and *z* co-ordinates which define where the sub-object is in relation to the parent object and three angles which define how far the sub-object is rotated about the *x*, *y* and *z* axes. In these demos only the second angle is used.

SORTING

The 3D world is displayed using the following steps:

1 Each object is examined, and the 3D co-ordinates converted to 2D ones.

2 The 2D representation is stored as a set of triangles.

3 The average *z* co-ordinates of the triangles are also stored.

4 The triangles are sorted according to the average *z* co-ordinates.

5 Starting with the rearmost triangle, the world is now plotted. (In fact, the scene is stored as PLOT commands to be played back at the end.)

The Merge keyword is used in some of our definitions, to avoid problems with sorting. For example, doors are merged onto walls so that they are always plotted after the wall itself.

Otherwise the wall and door would be treated separately and occasionally the door might be pushed behind the wall.

SORTING AND CLIPPING

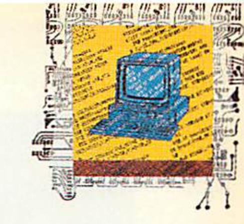
As we mentioned before, one of our main objectives is to keep the number of objects and calculations to a minimum. Rather than work out which triangles obscure which others, we plot from the back forward.

Using the average *z* co-ordinates to sort by is sufficient for this simple example, but a more complex comparison is needed if the objects in the world overlap more subtly. The object-oriented approach also helps here. If one house is behind another we do not need to compare individual features like windows. We plot the rear house, then the front one – this means you have to deal with fewer comparisons, so you get faster graphics.

Clipping is an important way of reducing workload. The picture of the houses shows the section of the 3D world we see. It takes the form of a square-based pyramid, extending through the screen into the imaginary world. The pyramid base is the monitor screen, the apex is your eye. Clipping involves discounting invisible objects and is done in two stages.

First, all objects outside the 'view volume' are ignored. This includes those wholly to the left, right, above or below the pyramid, those behind us and those too far away to see. Those not discounted are displayed, but any parts off-screen are clipped by the operating system. When we write display routines, we do this 2D clipping ourselves.

3Ddemo2 uses another time-saver. If an object has no holes in it, any faces that point away from us must be obscured, so needn't be considered. *3Ddemo2* uses this to reduce the number of triangles plotted and speed up the display.





The two Daves get into moving windows, distorting butterflies and a new Life competition

STAR PROGRAM

IT'S A WRAP

Program: Distort
Description: Graphics distortion demo
Author: David Jeffries
Machine: 32-bit

This program was originally to animate a rotating globe. It takes any mode 15 screen picture and, by default, wraps it round a sphere. Before running it you must have a full screen, mode 15 sprite handy. If you have none, you could always grab a snapshot of a mode 15 desktop with *Paint*. You will be prompted for a radius. This can be anything between 0 and 512. Obviously, the larger the value the larger the resulting image but the slower it will animate.

The PROCMAKESHAPE procedure does the hard work of working out the mapping needed and, by changing the formulae on line 1040, you can make the program map the sprite onto some very weird shapes. Try x2 = r2.* COS(2*a) or x2 = r2 * COS(a/2):y2 = r2 * SIN(SQR(a)).

The first sin and cos (for x and y) determine the shape of the object (in polar coordinates); the second (for x2 and y2) determine how it is wrapped around the object.

Take a look at the butterfly on this page to see the program in action. Is starts off as the normal image shown above and ends up with its wings wrapped around a sphere, as on the right.

MOVING WINDOWS

Programs: WindMove (RunImage, WMdat)
Description: Desktop utility
Author: Andrew Cumming
Machine: 32-bit

This small application adds a little extra control to the desktop environment. Andrew describes his utility:

'*WindMove* allows any window on the desktop to be moved, scrolled in either direction and resized. It was designed with *FormEd* in mind, since it allows windows without title bars, scroll bars or a size icon to be moved, scrolled and resized respectively, without you having to repeatedly change all the window flags.

'When the application is started, an icon showing a greyed-out window with four arrows to each side appears on the icon bar. Pressing Select while on the icon will cycle through the four functions (move, resize, horizontal and vertical scroll). The relevant portion of the window and arrow are highlighted on the icon bar. Adjust will return to the greyed-out icon, as the facility is switched off.

'When you select a particular function, moving the pointer over the work area of any window on the desktop will result in the pointer changing to the shape of a hand. You will then be able to drag the window.

'The program works by intercepting null events and monitoring the position of the pointer with SYS "Wimp_GetPointerInfo". When a click on Select or Adjust is detected, SYS "Wimp_DragBox" is used with a parameter from one to four; this results in one of the system drags: either move, resize or scroll.

'Note that the pointer is reprogrammed to be pointer shape 1. This is important since pointer 1 is used as the default and pointers 3 and 4 are programmed by the *Hourglass* module. The sprites used on the iconbar and for the hand pointer can be found in the file *Sprites.*' To use *WindMove* first create a directory (*!WindMove)* and save the *!RunImage* program inside it. Now, simply run the program *WMdat* from within *!WindMove* and this will create the *!Run, !Sprites* and *Sprites* files.

QUICK *DIR

Programs: FDModAsm, MakeDList
Description: Quick directory finding utility
Author: Simon Heys
Machine: 32-bit

This utility will be a boon to those with hard discs who spend



time out of the desktop. If you have a rambling directory tree and need to leap deftly between the branches this is what you need.

The utility takes the form of a module which is assembled by *FDModAsm* and is saved in the current directory library as *FDMod*. You will first need to run *MakeDList*. This scans the directory tree from $ and builds up a file called *DirList*: simply a complete list of directories on the current disc, in order and zero-terminated. This is assembled into the module by *FDModAsm*. Note that both programs expect to be run on your 'working' hard disc and *FDMod* will be specific to that drive.

When you are ready, simply load the module with *FDMod and use the command provided, *FD <name>, to select the directory you need. The *FD command takes the name given and finds the first full pathname that contains it.

For example, this text is being saved in my directory *$.StarInfo.1993.F-Jun*, so I could jump straight to this directory with *FD 1993.F-Jun. I could then type *FD F-Jun but this would match *$.StarInfo.1992.F-Jun* which appears earlier in the tree.

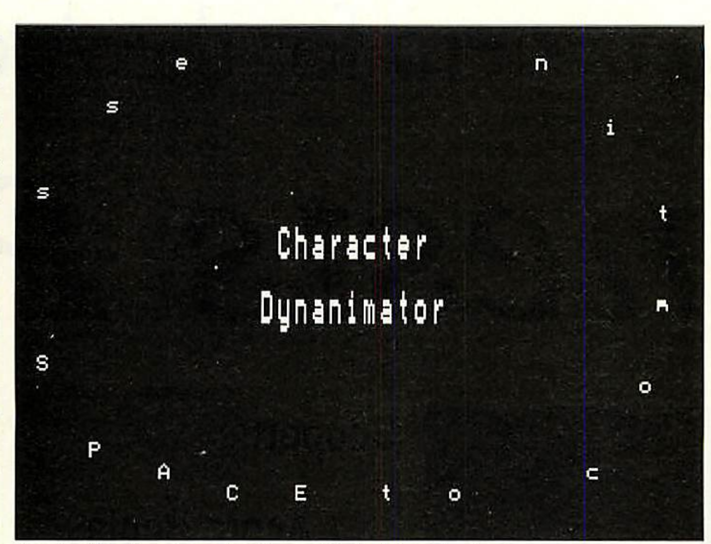
Providing your directory names accurately describe what lies in the directories, you only need type a small portion of the desired destination. The last part of the name can be abbreviated, so, in the example above, *FD 1993.F would have done the trick.

DYNANIMATOR

Programs: CharDyn, CDdemo, CDexamp, CDex2
Description: Animated text demo
Author: Andrew Bennett
Machine: Eight-bit

This spectacular eight-bit offering is ideal for adding a bit of life to your dull text screens. The *Character Dynanimator* animates characters according to predefined paths. Although the characters are plotted at TAB positions, the effect is smooth.

The work is done by a piece of machine code assembled by *CharDyn* and saved as *CDCode*. The three other demonstrations simply perform the command *LOAD CDCode and call the routine when needed. Note that the routine is assembled at &900 and is a bit more than 512 bytes long, so creeping into the function key buffer.



Spectacular character animations with the Dynanimator

DYNANIMATION FORMAT

The following is a description of the dynanimator subprogram format:

Byte	Description
0	number of subprograms
1,2	pointer to first subprogram
3,4	pointer to second subprogram
5,6...	pointers to subsequent subprograms

Each subprogram takes the following format:

a+0	initial delay (1/50 secs)
a+1	delay between letters (1/50 secs)
a+2	direction (1=forward, &FF=reverse)
a+3	length of string
a+4...b-1	string itself
b, b+1	first x, y co-ordinate pair
b+2, b+3	second pair
b+4...c-1	subsequent pairs
c	contains &FF to terminate program

where a is the address of the start of the subprogram, and b and c are addresses that depend on the string length and number of co-ordinates.

It also uses workspace at &1100. This means that if you have a Master or Compact you should ensure PAGE is set to &1900 or above before running any of the demos. Alternatively, alter the addresses in *CharDyn* and re-assemble the code at a different place. All demos run in mode 7, where character plotting is fastest.

CDexamp is a simple example and shows not only how to call the animation routine but the basic format of an animation program. The code is loaded at &900 and called with X and Y pointing to the program. The format is summarised above. As you can see, each program is made up of subprograms; these are executed simultaneously.

Typically, each word in a sentence, or even an individual letter in a word, might be animated using its own subprogram. A subprogram describes what text is to be animated, where it starts, how long to wait initially and between letters, and which points the letters should visit on their journey. These points are simply co-ordinates you would use in a PRINT TAB(X,Y) command. You can also specify the direction (1 or &FF); this determines whether the initial or final letter comes on first.

Of course, if you are animating a word you don't want all the letters to end up in the same place. In this case set bit seven of the X co-ordinates of a point (add 128 to it). The X co-ordinates of the letters will then be adjusted according to their position in the word.

We came up with the extra example *CDex2* to show how you can build up paths from Basic. The routine PROCrand_path takes as parameters the final X co-ordinate of a word and an offset (effectively the Y co-ordinate). It then builds up a random winding path from the bottom of the screen.

For a full-blown demo, now try *CDdemo*, which shows square, circular and sinusoidal paths and many other ideas.

Note that when constructing an animation, care must be taken not to wipe out earlier words with later ones. If one path crosses another, a word that has finished its movement may be affected by anything else whizzing past, so choose your routes carefully.

MIRA IMAGE

Program: Mira
Description: Fractal graphics
Author: John Williams
Machine: All

Fractal plotting is a common feature in ✱INFO. John Williams from Exeter continues our homage to this subject with an exploration of Mira fractals. These fractals are named after the physicist who first investigated them.

We start with prescribed values for x_0 and y_0, the co-ordinates of an initial point. Then, the (n+1)th point with co-ordinates (x_{n+1},y_{n+1}) is determined from the previous point with co-ordinates (x_n,y_n) by the equations:-

$f(x)=(1-A).X+2A.(1-g(x))$

$x_{n+1}=f(x_n)+B.y_n$

$y_{n+1}=f(x_{n+1})-x_n$

where $B = 1$, or slightly smaller and A is any non-zero positive constant less than 2. The function $g(x)$ must be chosen to satisfy the condition that its magnitude tends to zero as x increases indefinitely. The program contains eight different functions which obey this condition but many others exist.

The pixel corresponding to the computed co-ordinates x,y is scaled according to its factor and plotted on the screen with an offset. These values are found by trial and error so the final fractal is centralised, filling the whole screen.

The program *Mira* has been kept as simple as possible.

The *de facto* standard multimedia authoring system for the Archimedes

Genesis Plus

The Genesis family of multimedia authoring systems is the most widely used on the Archimedes, and now produces applications which can also run, without change, under Windows™.

Genesis Plus allows the creation of applications consisting of linked pages of information in a wide variety of formats. Pictures, sounds, animations and text can be added simply by dragging files into frames on your page - just like using a DTP package. Text can also be typed directly into frames and formatted to suit.

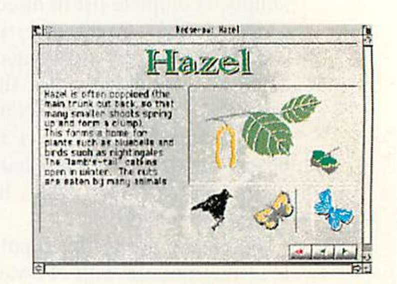
The power of Genesis lies in the fact that every frame can be readily linked to other pages so that information can be organised and cross-referenced very easily. Simply clicking the mouse over a linked frame will then lead to further information about the object in the frame, or might play a sound sample relating to the subject in the frame.

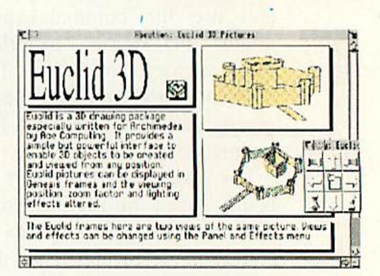
Genesis Plus uses powerful compression algorithms so that data is stored efficiently. It is capable of running well even on 1Mb single floppy disc machines, but has sufficient power to manage even the largest of CDROM based databases.

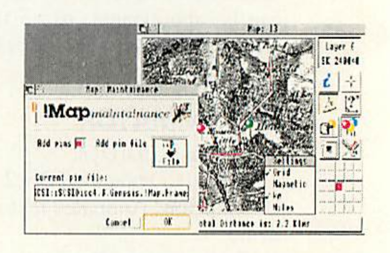
Supports:

- ❑ Acorn Replay
- ❑ Ace Films
- ❑ Euclid 3D Files
- ❑ Sound Samples
- ❑ Maestro Files
- ❑ CDROM
- ❑ Laservision
- ❑ Video Digitisers
- ❑ Genlock
- ❑ DrawFiles
- ❑ Sprites
- ❑ Text
- ❑ CSV Files
- ❑ Template Files

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Eight example fractals have been included that make use of some of the *g*-functions defined. These can be plotted by entering their number. John encourages you to experiment with the data given. You can start simply by adding extra example shapes using the pre-defined *g*-functions.

For this you need to change *A, B,* x_0 and y_0; *A* should be between 0 and 2. Some values give dull groups of discrete curves. Also, avoid 0.5, 1 and 1.5 which produce lines of dots. *B* should be 1 or slightly smaller. Choosing a value for *B* of less than 1 spirals the fractal into hot spots, making good fractals harder to find.

The initial values of x_0 and y_0 need not be equal or positive. Choose from about -14 to 14. Notice that small changes in *A, B,*x_0 or y_0 can radically alter the fractal. Start with *xc* and *yc* roughly in the centre of the screen and *sc* about 25. Large values of *A* may need *sc* to be reduced. These can be tweaked once you have found a good shape. If you are feeling more adventurous, try adding extra *g*-functions to the data statements and using them to generate more fractals.

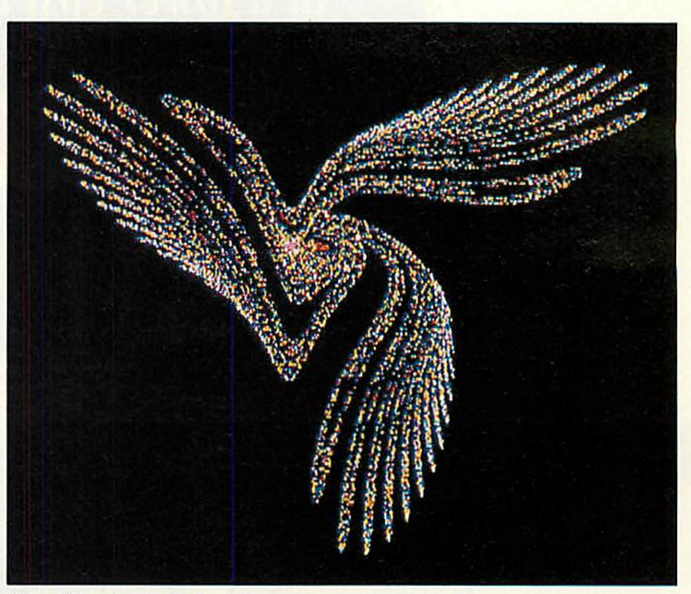
MOULDY MOUSE

Program: Mould
Description: Graphical demo
Author: David Llewellyn-Jones
Machine: 32-bit

I must say, we do get some odd programs at *INFO sometimes. Take *Mould* by David Llewellyn-Jones, from Thundersley in Essex, for example. Any program that has a Mouldy Mouse option on the menu has to be severely peculiar.

There's not really much to say about *Mould;* just run it and see. David says (and we agree with him) that the Mouldy Mouse option is the best, and can form the basis for a game.

First, fill the whole screen with mould (holding down the middle and left buttons makes for the most interesting effect) then try and eradicate it all by using the right-hand button. This is not as easy to do as it looks, but we managed to do it... once.



Mira, Mira, on the wall

ONE LINE CORNER

We have four one-liners for all you miniaturisation fans. First up, a program from the March issue gets the treatment:

Bell7/1 is a one-line bell-ringing piece by DL. It was quite a struggle to get the original 7K down to one line, but after a lot of hair-pulling I made it fit. When you run it, it prompts you to input the number of bells, the pattern of changes in place notation and the delay after each bell.

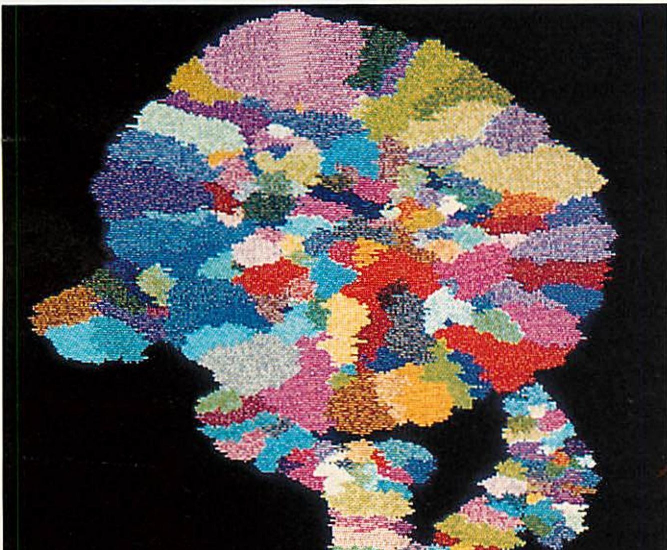
Between 4 and 8 is normally suitable, 0 can be used to all but stop the sounding of the notes and, with a sneaky CTRL B, to obtain hard copy of the changes. The program will then ring rounds.

To ring the changes, press and hold down SHIFT until the start of the next pair of rounds. Once you are started, you can release SHIFT.

If you are after stunningly nasty visual effects, Richard Wilkie's *IceTrain/1* is your program. Run the program, then concentrate on the centre of the image (Arm 3s should be disabled first). Allow your eyes to go out of focus if you wish, then try to get the image to rotate in the opposite direction. Now press ESCAPE and keep your eyes on the screen. Well. Did you press ESCAPE? For the stronger willed, try placing your hand on a desk and examining it after staring into the depths.

Orblet/1, a ball game by Robbie Davies, is an easy one to explain. Press a mouse button to make your ball, sorry, orblet, bounce off the left-hand side of the screen. You can move over the thin lines, but the large blocks are deadly. How high can you go?

Also from Robbie Davies comes *Tune/1*. The soothing music here should come as a welcome relief after watching *IceTrain*. A very nice, and very clever program. A three-channel tune, complete with chords; we still can't work out how it works.



Mould

LIFE COMPETITION

And now you have your regular chance to show off your programming ingenuity with our latest challenge. It's based on the good old game of *Life*, featured time and again in this magazine and others. Some time ago, someone came up with the idea of *Life For Two* – a competitive version of the original game. And here is your challenge. You must write an intelligent procedure that plays *Life For Two*.

All the entries will battle it out with each other in a knock-out competition and the author of the victorious routine will win £25 and a great deal of admiration from *Acorn User* readers throughout the world. Just for the record, the original *Life* works as follows. A simple world consisting of a grid or array is inhabited by simple beings or cells. Each square in the array may be empty or occupied by a single cell. After setting up an initial population (either deliberately or randomly) future generations are determined by applying a simple rule to each square.

Each square has eight neighbours (including diagonal ones) and the board wraps around horizontally and vertically. A new cell is created in an empty square which has exactly three cells as neighbours. An existing cell will survive another generation if it has two or three cells as neighbours. Any fewer than two and it will die from loneliness. Any more than three and it will be killed through overcrowding. From this simple rule, complex patterns of life emerge.

LIFE FOR TWO

In *Life For Two* there are two sorts of cell, one for each player. These are red and green on the screen. The game begins with an empty world, which, for the purposes of this

challenge, is five by five squares in size. The players take turns to place a cell in an empty square. This continues for three rounds until six cells – three of each type – are on the board. Then the amended rule of *Life* is applied.

Each cell with less than two or more than three neighbours dies. Any cell with two or three neighbours will survive, even if those neighbours are of the opponent's type. A new cell is created as before, if there are exactly three cells as neighbours. In this case, the type of the new cell is set to whichever type numbers most among its neighbours. So, an empty square with two red and one green cells in adjacent squares will spawn a red cell next generation.

Now the players take turns in placing one more cell of their own colour in any empty square. The rule of *Life* is again applied, until one or both players' cells have been wiped out or until a fixed maximum turn number is reached, in which case the player with the most cells is the winner.

The 32-bit version is called *Lives32* and this program will be the one used to test all entries. Three thinking procedures have been supplied as examples. These should be saved separately in a directory called *Procs*.

The main game *Lives32* scans *Procs* and makes a list of all entries. It then plays each entry against the others at a fixed number of games (set by to_play%) The three examples, in increasing order of cleverness, are *Stupid, Simple* and *Best*. A high-score table is shown after each match.

A thinking routine takes the form of a function with the same name as the file containing it (converted to lower case). So, in *Procs.Simple* the thinking routine *FNsimple* is the one that actually supplies the next move. Each entry must have a unique name that is used for the thinking routine and the Basic filename. We suggest that you use your name (*FNjrhartley*) or postcode (*FNnw10ag*) so your routines don't clash with others. All variables used by a thinking routine must either be local or have a name prefixed with the unique name (*jrhartley_board%*).

The thinking routine obeys six parameters in all. These are the only variables from the main program the routine may use. They are as follows:

board% is the grid itself. This is a 25-byte block of memory containing the current state of the playing area. The first five bytes describe the first row, the next five the second row and so on. Each byte may be zero (empty), one or two (occupied by a player's cell).

player% is the player's colour. This will be one or two and may vary between games.

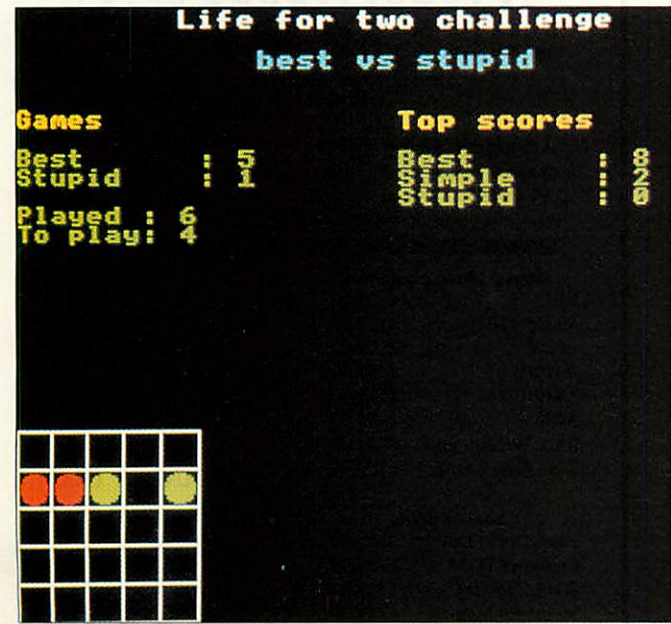
turn% is the turn number. This will be 1 for the first move and will increase by 1 each turn. Your routine will also be called once before play starts with turn%=-1. This is to allow initialisation of arrays and so on. In this case, the only other valid variable is size% and your routine should return zero.

size% is the size of the grid. For the purposes of the competition it will be five.

irst% is the player who goes first. If first%=player% then the life rule will be applied after your opponent's move; clever routines may wish to take this into account.

left% is the time your routine has left to it in centiseconds. Your routine may wish to alter its strategy depending on the time left.

The value returned by your thinking routine should be a number in the range *0* to *size%*size%-1*. This is an offset into the block of memory containing the playing area. If



Best vs Stupid: guess which will win

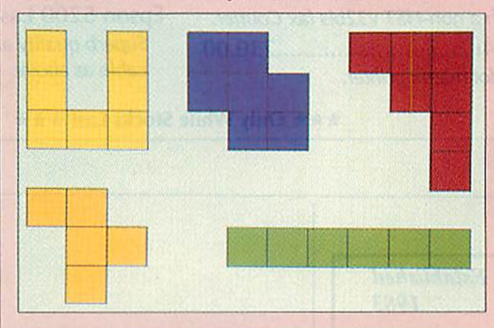
RESULTS OF OMINOES

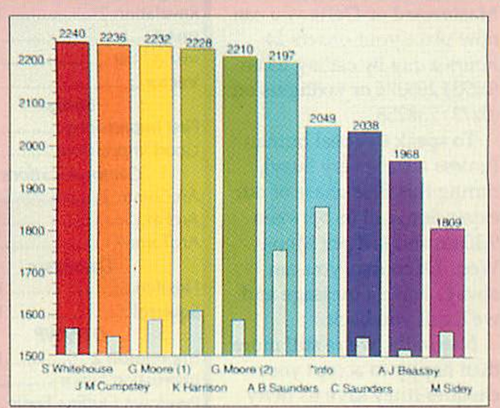
We had a reasonable response to this challenge, not as good as the maze puzzle, but then it was a harder problem. The task we set was to try and fit ominoes (A domino has two squares, we provided shapes of up to five connected squares) onto rectangular boards, some of which had immovable blocks already placed on them. The winner, by a whisker of four pieces, is Stuart Whitehouse of Slough. £25 and our congratulations go to him.

Mike Cumpstey came a close second and Gareth Moore third. The top 10 entries (which include one of our own efforts) are shown on the right. The grey bars represent the time taken by each entry.

As promised when we originally set the challenge, we added a few extra ominoes to the set used by the program. A few of you noticed a mistake in the data lines which meant that one pentomino was not provided, so we corrected the data to generate this one properly and added the four other shapes shown below.

The finalists were run over 100 boards with the main_seed set to 281283. Stuart's winning entry can be found on the monthly subscriber's disc.





Many techniques were used to solve the problem, but the most common lines of attack were: connectivity – how many sides of the new piece were touching pieces already placed; fragmentation – the number of areas that would be created by placing a piece; gravity – the distance from the centre of gravity of the empty area.

Lots of entries also tested for symmetry of the piece to be placed, to cut down on the number of orientations tried.

Stuart's program used four different placement algorithms as the board slowly filled up. He also made use of a couple of timesaving tricks. First was a routine that filled in any gaps of one or two squares which couldn't otherwise be used, but would still get checked by each piece.

Secondly, when whole rows or columns were full at the edges of the board, the search area was reduced. Many thanks to everyone who took part. We hope you like our next challenge.

the offset is outside this range, or the square indicated is already occupied, a foul will be declared and the game forfeited. To enter you must supply a Basic program. This should contain both your thinking function and any other functions or procedures that it calls.

Variable and procedure names must be in accordance with the guidelines above. Entries can be accepted on 3.5 or 5.25in discs. Include also a text file containing your name and address.

If you would also like to include details of how your routine works these may be used when we publish the results in the October 1993 issue. As well as publishing the winning entry (which will earn £25 for its creator) we will publish interesting or novel entries if space permits. We also hope to provide a playable version of *Life For Two*, letting you pit your wits against the best solutions.

EIGHT-BIT ENTRIES

From previous challenges we know some of the best entries come from eight-bit owners. However, because of the competitive nature of this challenge, we have to choose one machine to test the entries on. For practical reasons, this will be an Arm3-based machine.

Eight-bit users are welcome to enter however. Providing you stick rigidly to standard BBC Basic (no references to specific memory locations like &900 or 6502 assembly language) your routines will work fine on our 32-bit test machine.

So you can try out your routines we provide *Lives8*, essentially the same as *Lives32* but suitable for eight-bit machines. It can run in mode one or mode five (set mode% at the start depending on the memory of your machine) and contains eight-bit versions of the *Simple* and *Best* thinking routines at the end.

You should replace one of these with your own routine and change the strings in the arrays *proc$()* and *player$()* accordingly. Like the 32-bit users, please use a unique name and use it as a prefix for all non-local variables.

OTHER RULES

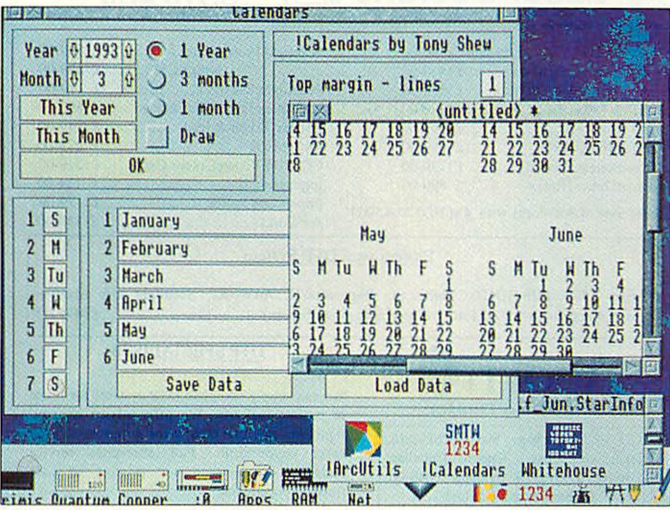
1 Entries will be divided into groups of ten and surplus entries split evenly between the groups.

This will be done randomly. Each entry will play two games against each of the other entries in its group, once going first and once second. The top five entries, and any tying for fifth place, will proceed to the next round.

2 Step one will be applied zero or more times until there are fewer than 20 entries left. These will be played against each other, this time with four games between each possible pairing (two going first, two going second).

If there is a tie for first place, all those tying will be entered into an extra round. Each pairing will then play 10 games. If there is still a tie, the prize will be divided.

3 Any entries causing an error or taking an inordinately long time for a move (more than three minutes) while in operation will be expelled from the competition.



Calendars: free on the subscriber's disc

4 A time limit of three minutes per game will be enforced. If a routine runs out of time the game will be forfeited.

5 No machine code entries are permitted. This restriction has been made for two reasons. Firstly, 6502 users would be at a disadvantage since the testing will be on a 32-bit machine, and, secondly, we felt that the spirit of the competition is to find ingenious rather than brute-force solutions to the problem.

6 We have deliberately not put a limit on memory usage since this is difficult to enforce. Please bear in mind that the entries will be tested together on a standard 4Mb machine and we reserve the right to exclude entries which use up sufficient memory to halt the testing process in some way.

7 Your routine must not tamper with the main program in any way, or access variables other than those passed to it.

8 You may enter up to three different routines. There must be no collusion between them.

9 The closing date for entries is 16 July 1993.

TACTICS AND DEVICES

The three examples show certain devices that may be of use to entrants. *Stupid* is just that, choosing any random empty square for its move.

Simple scans the board to find squares with two adjacent cells that might produce a new cell next generation.

Best actually tries out each possible move, applies the life rule and counts up the cells of each colour to find which move has the best effect on the relative populations. *Simple* and *Best* both copy the memory block at board% into Basic arrays with edges duplicated on each side. This makes checking quicker.

*DISC

We have a couple of bonuses for subscribers this month (apart from Stuart Whitehouse's winning entry). Both can only be found on the monthly subscriber's disc. The first comes from Tony Shew of Rochester in Kent.

He has submitted a desktop calendar program which produces monthly or yearly calendars in either plain text or draw text-area format. The program has been written in C and the full source code, template file, sprites and help text is included within the application directory.

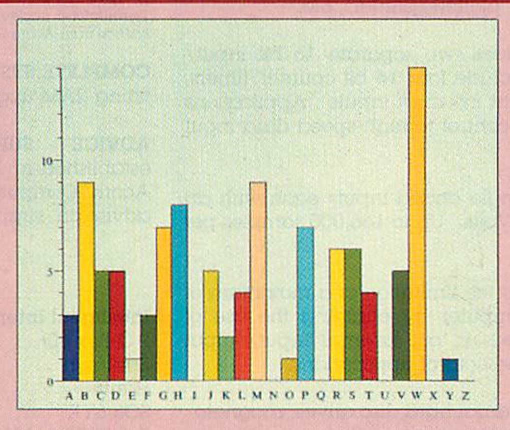
Our second freebie has been sent in by Andrew Timms of Watford. *ArcUtils* contains a small selection of desktop utilities that many of you will find very useful. For full subscription details turn to p63.

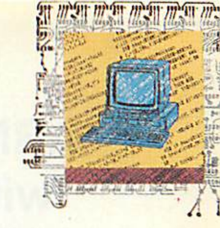
*QUIT

Listings, applications, hints, tips, requests are always welcome as contributions to *INFO. All but the shortest listings should be on disc together with a description. Please write your name and address on all discs. A stamped, self-addressed envelope will ensure the return of your disc.

We also want to hear from you if your Christian name begins with E, F, O, U, V, X, Y or Z and your surname begins with I, N, Q, U, X or Z. As you can see from the special bar chart on the right, these initials are sadly lacking. We would also be grateful for any explanation as to the number of W surnames.

Send your submissions to: *INFO, BBC Acorn User, Redwood Publishing, 101 Bayham Street, London NW1 0AG.





HINTS AND TIPS

Technical trickery and useful tips from your fellow readers

Welcome to the first instalment of Hints and Tips. This is the spot where *you* get the chance to share that life-saving tip with the Acorn community. Over to you . . .

CUSTOMISED PALETTE

Ben Summers

Most modern applications contain message files in which details of menus, error messages and other text items are stored; the idea is that you can change the message file to customise the application without having to rewrite the application itself. The Rom applications are no exception, and probably the most useful change you can make is to set up your own mode list for the Palette Utility.

The method is based on the ability of Risc OS to search for files along path system variables. For those of you who haven't met this, you can set up a system variable with a name like System$Path, containing pathnames of directories separated by commas (but note, each must end in a '.').

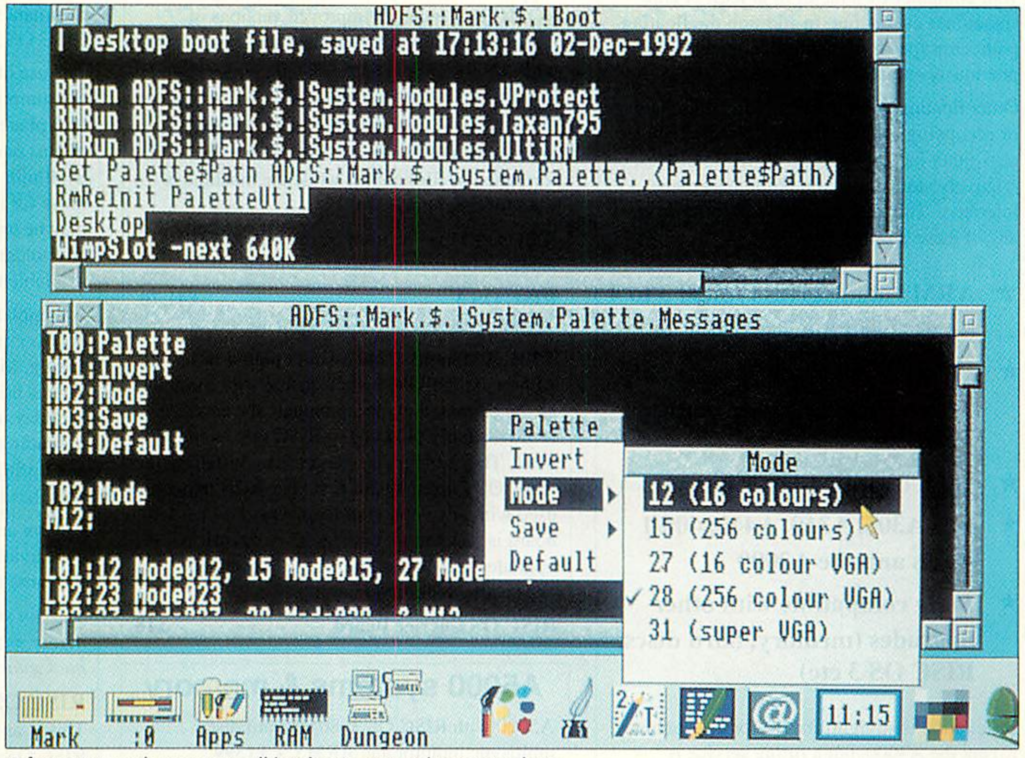
When you want to access a file on this path, you use a filename such as 'System:filename'. If the file is not found in the first directory in the path, it will be looked for in the next directory in the list and so on. If it isn't found in any of them, a 'File not found' error will be reported as usual. The Rom applications use paths to access their resource files, including their message files.

First, choose Open '$' from the Apps menu. Open up the *Resources* directory, and then copy the *Palette* directory to a convenient place on your hard disc, for instance inside the *!System* directory. The following assumes that you have placed it there.

First, delete the *Templates* file from inside the directory as you don't need it (unlessyou want to change that as well). Now add the following three lines near the beginning of your desktop boot file:

```
Set Palette$Path adfs::Hard
Disc.$.!System.Palette.,<Pa
lette$Path>
RMReInit PaletteUtil
Desktop
```

The first line changes the palette path to make it search first in your new directory (make sure the pathname is correct for your disc) and then in the Rom directory. The second line re-initialises the Palette utility, and the third makes it appear on the iconbar.



A few extra pathnames are all it takes to customise your palette

Now load the *Messages* text file into *Edit* so we can customise the contents. The line you need to change depends on your monitor; if you have a normal monitor, change the line beginning 'L??:', and if you have a multisync, the one beginning 'L01:'. The rest of the line defines the mode menu for that type of monitor. The format of each entry is:

```
<mode number><space><desc.>
```

Follow this exactly, otherwise it won't work. The mode number is the mode which will be set when the menu entry is chosen, and the mode description is what is displayed in the menu. It actually references another line.

You will notice that further down the file there are a lot of lines beginning 'Mode0xx:'. You can add new ones for modes that are not listed. There is also a special entry '? M12'. This is the writable entry where you can type in modes not listed. Unfortunately, you cannot have more than one. Try it, and see what happens...

An example for multisync monitors is:

```
L01:12 Mode012, 15 Mode015,
 20 Mode020, 27 Mode027, 39
 Mode039, 21 Mode021, 29 Mo
de029, 35 Mode035, 0 Mode00
0, 31 Mode031, ? M12
```

QUICK FILE SELECTION

Alan Hodson

Risc OS 3 has a useful facility allowing you to drag a box in a filer window to select multiple files. However, the files inside the box are not necessarily selected, but their status is simply toggled, as if a logical NOT were applied.

This can be most useful. For example, if a filer window contains 10 files and you only want to delete eight of them, then select the two files you wish to keep, and drag a box round all 10 files. The two you wish to keep will become deselected, and all the rest will be selected, enabling you to delete all eight files without having to select each one separately.

JUNIOR INTO SENIOR

PG McTiernan

If you have upgraded from *Impression Junior* to *Impression 2*, you may be annoyed to find that double-clicking on an old *Junior* document does not load it into *Impression*, but gives an error message.

Impression can be altered to load *Junior* files quite easily. Simply use *Edit* to add the following line:

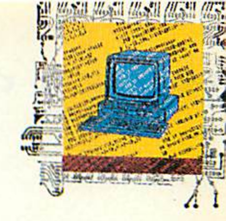
```
Set Junior$Path <Obey$Dir>.
!Run
```

to the files *!Impress.!Boot* and *!Impress.!Run*, just after the line

```
Set Impression$Path <Obey$D
ir>.!Run
```

Now your *Junior* files will load straight into *Impression*.

If you have any of your own tricks to share, send them in to us at: Hints and Tips, *BBC Acorn User*, 101 Bayham Street, London NW1 0AG.



So we come to the final instalment in this programming series. To round the whole thing up, this month I am not going to focus on a specific topic. Instead, I'll look at useful shortcuts and programming techniques and try to answer some of your questions.

How can I deal with non-integer arithmetic?

Handling non-integer arithmetic in machine code is no easy matter, as Arm instructions are only designed to deal with integers. Many of you will have heard of the Floating Point Emulator, which is simply an operating system module that pretends to be the Floating Point Accelerator chip; in other words, it provides a number of assembler instructions to deal with floating point numbers.

The FPA chip itself (which would run very much faster than the emulator does) has been in development for an awfully long time and has yet to be seen. However, the Arm developers have included instructions which give the processor access to a co-processor (such as the Floating Point Accelerator) and you can use these within your code. The C compiler, for instance, produces code containing these instructions. These instructions are beyond the scope of this article, unfortunately, but here's a shortcut, well-known by programmers, which uses fixed-point numbers.

Take the full 32 bits available to you and place an imaginary decimal point between, say, bits 15 and 16. This effectively gives you a 16-bit number with 16 bits-worth of decimal places. All arithmetic on fixed-point numbers behaves as you expect, but is considerably faster than the emulated floating point. The only time you have to be careful is when you use multiplication, as the decimal point will move.

Multiplying two eight-bit fixed point numbers together will give you the correct answer but with 16 bits of fraction, so don't forget to shift the result down with an ASR afterwards. *Arm1* demonstrates the method. Note that some fractions are impossible to represent using this, like 1/10th, for example. So, 10×0.1 doesn't give you quite the result you would expect.

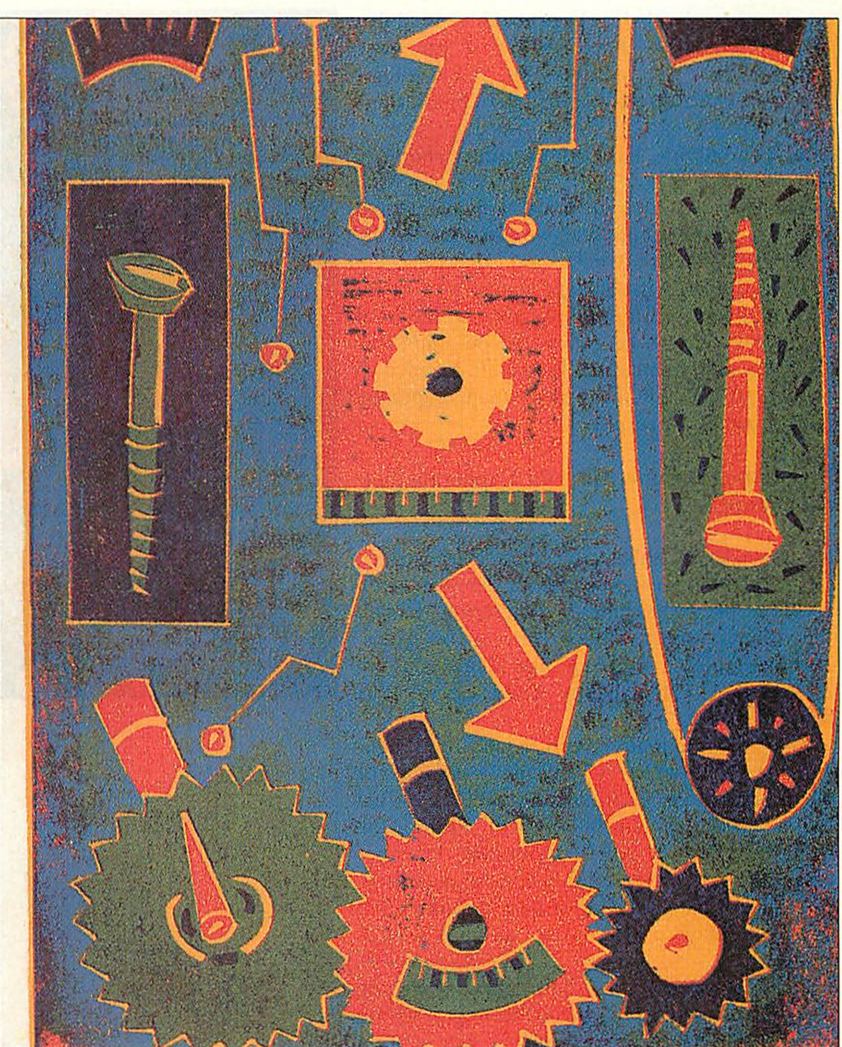
How do I divide numbers in Arm code?

The Arm can add, subtract and multiply quite happily with single instructions, but unfortunately there is no divide instruction; luckily there is the magic code given in *Arm2*. This divides R0 by R1 and returns the integer result in R0 and the remainder in R1. In other words: R0 DIV R1->R0, R0 MOD R1->R1. The first few instructions initialise a few registers and make sure that the two numbers to divide are positive.

The register sign contains the sign of the final result. If both are positive or negative, the result will be positive, otherwise it will be negative; hence an EOR will do the trick for us. Two other shortcuts are used by the rest of the routine.

The first saves wear and tear on your fingers and helps eliminate typing errors by implementing a macro called FNdiv. Macros allow you to repeat a section of code, with different parameters if necessary, without having to physically duplicate the instructions. Essentially it is a subroutine call, but instead of assembling a branch (with link) to the code, the subroutine itself is included in-line with the main assembly. This uses more memory, but the resulting routine runs a lot quicker, as the processor doesn't have to keep executing time-wasting jump instructions all the time.

The second shortcut does save time in execution. Before each block of eight calls to FNdiv, a quick check is made to see if the dividend (the



ASSEMBLY LINE

Dave Lawrence finishes off his programming series with some handy shortcuts

number to be divided) is big enough to need this block of divisions. For example, if you were trying to divide the number 100, you wouldn't need to perform any of the first three blocks.

Fine, I can divide. How about square roots?

Again, there is no square root Arm instruction, but, with a little bit of code, we can come up the routine illustrated in *Arm3*.

This calculates the integer square root of R0 and returns the result in R0. As you can see from the PRINT loop at the end of the program, this routine actually calculates the result rounded to the nearest whole number rather than simply the integer part of the result.

I'm writing a game. How do I generate random numbers?

Many random number generators are based on the short program segment from the chapter on sound in the Programmer's Reference Manual. This shows how a random bit can be generated using a seed value and the magic constant &1D872B41. The listing *Arm4* shows this theory in action.

The seed is initially set to the Basic pseudo-variable TIME, which is sufficiently random for our purposes. On each call, the seed is shifted left one place. If a 1 falls out of the top, the register is EORed with the constant. In either case, the seed is stored ready for the next time. The state of the carry flag is then 'random'. We use this to return a zero or one, which is used as a colour.

This algorithm is fine for producing individual random bits, but collecting a stream of them and producing a larger number is not a very good method of generating random numbers. A much better way is shown in *Arm5*. Again, a seed value (initially set to TIME) is used, but now two magic numbers are used (stored at c1 and c2). The routine is an implementation of the function: seed=(seed*a+c) mod m, where a, c and m are carefully picked.

As we don't want to be lumbered with a division in our code, we want m to be 2^{32}, so the fact that our registers are 32 bits wide will perform the division for us for free. Given this, the multiply and add can be performed amazingly quickly and neatly with one MLA instruction. So why are there two?

Well, using this system, the bottom bits of the number tend not to be *that* random. So, you can either ignore them (by shifting the result down) or generate a second number and EOR the two together, with one rotated by 16 places, as this program does. This slows the process down a bit, so the first method is preferable if you don't need full 32-bit random numbers.

How can I claim some workspace for a subroutine?

A subroutine often needs a small amount of temporary workspace. This can be reserved by the main program and a pointer passed to the routine, or the memory can be set aside close to the subroutine, so an ADR can get to it. A much neater way is to use the stack. Say you need 32 bytes of memory, you could say:

```
SUB sp,sp,#32
MOV ptr,sp
```

at the start of the routine and

```
ADD sp,sp,#32
```

before returning. If you are not calling any further routines that use the stack, from *within* this one, this can be made simpler by just saying SUB ptr,sp,#32 at the start of the routine. Unless you've set up your own stack (and therefore know how big it is) you must be careful you don't claim too large a chunk in this way and fall off the bottom of the memory allocated to the stack.



What is the easiest way to code AND and OR?

This depends on the situation, but a particularly neat way involves adding condition codes to any instructions. I covered this method last August, but it is worth repeating. Say you need to check if R0 is 1, 4 or 17 and to set R1 to 1 if it is, you can use:

```
CMP R0,#1
CMPNE R0,#4
CMPNE R0,#17
MOVEQ R1,#1
```

In other words, the Z flag will be set when a match of R0 is found, in which case none of the rest of the compares will be executed, and R1 will be set to 1. If none of the compares are true, Z will remain clear and R1 will be left untouched. A similar system can be used for AND. If you needed to check if R0 was 3, R1 was 5 and R2 was 11, you could use:

```
CMP R0,#3
CMPEQ R1,#5
CMPEQ R2,#11
BEQ all_correct
```

The Z flag is kept set if each comparison is met. As soon as one fails, Z is cleared and no more comparisons are made.

What's the easiest way to swap two registers?

This is an interesting question because you may think you need a third register to complete the swap:

```
MOV temp,reg1
MOV reg1,reg2
MOV reg2,temp
```

This may be impossible in certain situations (without resorting to storing registers in memory). With a little thought, though, you can do the same function using just the orginal registers:

```
EOR reg1,reg1,reg2
EOR reg2,reg1,reg2
EOR reg1,reg1,reg2
```

How can I plot sprites? How do you read the keyboard? What is the best way to generate sound? How can I calculate sines and cosines? What are all these SWI calls for?

Well, I'm afraid all these topics are beyond the scope of this article. They, do, however, frequently crop up in the pages of ✱INFO, so keep your eyes on those pages for more advanced Arm programming. Likewise, if you have any queries on the intricacies of Arm code, please write to us at ✱INFO and we'll do our best to answer your problem.

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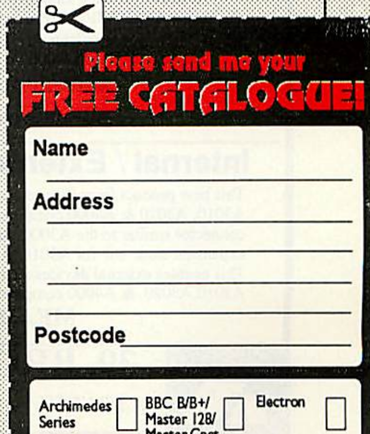
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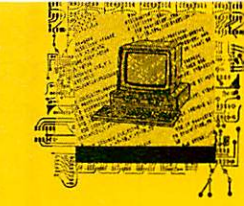


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YELLOW PAGES

Free programs for you to type in and use

HOW TO ENTER THE PROGRAMS

This section describes how to enter and use the more complicated programs in the yellow pages. A lot of the explanations mention the CSD: for more details on the Currently Selected Directory, see the box below.

3D GRAPHICS (page 90)

3DGraphics1 - 3DGraphics5

The first three programs (*3Dprocs*, *3Ddemo1* and *3Ddemo2*) need to be saved inside the same directory, which must be set to the CSD. Next, create a directory called *Objects* in the same directory as the three above programs are saved, and inside this directory save the two text files *House* and *World1*.

The two programs you can run are *3Ddemo1* and *3Ddemo2*, and both of these programs access the functions in *3Dprocs* and the data in *House* and *World1*.

***INFO (page 93)**

Info1 - Info4

Save all four programs on the same disc. To assemble the machine code, run *CharDyn* which saves a file called *CDCode*. To ensure that the three example programs all work, make sure that the *CDCode* file is in the same directory as the programs.

Info5 & Info6

Save the program *MakeDList* on the disc you wish to scan, and set the CSD to a directory where the file *DirList* will be saved. Then run the program *FDModAsm*, and the *FDMod* module will be saved in that directory.

Info7 & Info8

To create the full application, first create a directory called *!WindMove* and open it up by double-clicking on it with SHIFT held down. Then save the programs *!RunImage* and *WMDat* inside the directory. Finally, set the CSD to this directory and double-click on WMDat to create the *!Run*, *!Sprites* and *Sprites* files. The application is now complete.

Info16 - Info19

Save the first program, *Life32*, in a directory, and set that directory to the CSD. Next, create a directory called *Procs* in the same directory, and inside this directory save the three programs *Best*, *Simple* and *Stupid*.

To run the Life program itself, double-click on *Lives32*. Eight-bit users need only type in and run one program, *Life8*, as the functions are included at the end of that program.

Setting the Currently Selected Directory (CSD)

Some of the explanations above require the CSD to be set to a certain directory for them to work. To do this, you must first create an Obey file (using Edit), containing just the following line:

```
Dir <Obey$Dir>
```

Next save it under the name *ThisDir* in the directory you wish to set as the CSD. Finally, double-click on *ThisDir* to set the CSD to that directory.

COMPATIBILITY CHART

Use this chart to check if a program will work on your machine. There are two columns, one for eight-bit machines like the Model B and Master 128, and one for 32-bit machines, like the A3000, A400 or A3010. If there is a star for the program in the column then it will work on your machine. Special exceptions and hardware requirements are listed as foot notes at the end of the table.

Article	Program Name	8-bit	32-bit
3D GRAPHICS (page 90)			
3DGraphics1	3Dprocs		*
3DGraphics2	3Ddemo1		*
3DGraphics3	3Ddemo2		*
3DGraphics4	House		*
3DGraphics5	World1		*
3DGraphics6	PerspDemo		*
***INFO (page 93)**			
Info1	*CharDyn*	*	
Info2	*CDdemo*	*	
Info3	*CDexamp*	*	
Info4	*CDex2*	*	
Info5	*FDModAsm*		*
Info6	*MakeDList*		*
Info7	*!RunImage*		*
Info8	*WMDat*		*
Info9	*Mira*		*
Info10	*Mould*		*
Info11	*Distort*		*
Info12	*Bell7/1*	*	*
Info13	*IceTrain/1*	*	*
Info14	*Orblet/1*		*
Info15	*Tune/1*		*
Info16	*Lives32*		*
Info17	*Stupid*		*
Info18	*Simple*		*
Info19	*Best*		*
Info20	*Lives8*	*	
ASSEMBLY LINE (page 105)			
Arm1	*Arm1*		*
Arm2	*Arm2*		*
Arm3	*Arm3*		*
Arm4	*Arm4*		*
Arm5	*Arm5*		*
Arm6	*Arm6*		*

***INFO (page 93)**

Listing Info1

```
   10 REM     >CharDyn (Info1)
   20 REM     Character Dynanimator Sour
ce
   30 REM By  Andrew Bennett
   40 REM For 8-bit machines
   50 REM (c) BAU June 1993
   60 :
   70 MODE 7
   80 PROCsetup
   90 PROCassem
  100 PROCcheck
  110 PRINT "Saving 'CDcode'"
  120 OSCLI"SAVE CDcode "+STR$~mem%+" +"
 +STR$~(theend-runanim)+" "+STR$~code%+"
 "+STR$~runanim
  130 END
  140 :
  150 DEF PROCsetup
  160 code%=&900:data%=&1100
  170 maxprogs%=4
  180 maxobjs%=32
  190 zp1=&70:zp2=&72
  200 osbyte=&FFF4:oswrch=&FFEE
  210 DIM mem% &1000
  220 ENDPROC
  230 :
  240 DEF PROCassem
  250 PRINT "Assembling..."
  260 FOR opt%=4 TO 6 STEP 2
  270 P%=code%:O%=mem%
  280 [OPT opt%
  290 .runanim
  300 STX zp1
  310 STY zp1+1
  320 LDY #0
  330 LDA (zp1),Y
  340 BEQ ra_exit
  350 CMP #maxprogs%+1
  360 BCS ra_exit
  370 JSR setup_progs
  380 JSR setup_objs
  390 .ra_loop1
  400 LDA #19
  410 JSR osbyte
  420 JSR draw_objs
  430 JSR run_objs
  440 JSR run_progs
  450 LDA ob_act_root
  460 BNE ra_loop1
  470 LDA pr_root
  480 BNE ra_loop1
  490 .ra_exit
  500 RTS
  510 :
  520 .setup_progs
  530 TAX
  540 LDA #0
  550 .sp_loop1
  560 STA pr_next-1,X
  570 INY
  580 LDA (zp1),Y
  590 STA zp2
  600 INY
  610 LDA (zp1),Y
  620 STA zp2+1
  630 STY temp1
  640 LDY #0
  650 LDA (zp2),Y
  660 STA pr_wait-1,X
  670 INY
  680 LDA (zp2),Y
  690 STA pr_delay-1,X
  700 INY
  710 LDA (zp2),Y
  720 STA pr_dir-1,X
  730 INY
  740 LDA (zp2),Y
  750 STA pr_len-1,X
  760 CLC
  770 LDA zp2
  780 ADC #4
  790 STA pr_strlo-1,X
  800 LDA zp2+1
  810 ADC #0
  820 STA pr_strhi-1,X
  830 CLC
  840 LDA pr_strlo-1,X
  850 ADC pr_len-1,X
  860 STA pr_routelo-1,X
  870 LDA pr_strhi-1,X
  880 ADC #0
  890 STA pr_routehi-1,X
  900 LDA #0
  910 LDY pr_dir-1,X
  920 BPL sp_dirok
  930 LDA pr_len-1,X
  940 SBC #0
  950 .sp_dirok
  960 STA pr_char-1,X
  970 LDY temp1
  980 TXA
  990 DEX
 1000 BNE sp_loop1
 1010 STA pr_root
 1020 RTS
 1030 :
 1040 .setup_objs
 1050 LDA #0
 1060 STA ob_act_root
 1070 LDX #maxobjs%
 1080 .so_loop1
 1090 STA ob_next-1,X
 1100 TXA
 1110 DEX
 1120 BNE so_loop1
 1130 STA ob_del_root
 1140 RTS
 1150 :
 1160 .draw_objs
 1170 LDX ob_act_root
 1180 BEQ dro_exit
 1190 .dro_loop1
 1200 STX temp1
 1210 LDA ob_lastx-1,X
 1220 CMP #&FF
 1230 BEQ dro_notdel
 1240 LDY ob_lasty-1,X
 1250 JSR tab
 1260 LDA #32
 1270 JSR oswrch
 1280 LDX temp1
 1290 .dro_notdel
 1300 LDA ob_y-1,X
 1310 STA ob_lasty-1,X
 1320 TAY
 1330 LDA ob_x-1,X
 1340 STA ob_lastx-1,X
 1350 CMP #&FF
 1360 BEQ dro_ignore
 1370 JSR tab
 1380 LDX temp1
 1390 LDA ob_char-1,X
 1400 JSR oswrch
 1410 .dro_ignore
 1420 LDY temp1
 1430 LDX ob_next-1,Y
 1440 BNE dro_loop1
 1450 .dro_exit
 1460 RTS
 1470 :
 1480 .tab
 1490 TAX
 1500 LDA #31
 1510 JSR oswrch
 1520 TXA
 1530 JSR oswrch
 1540 TYA
 1550 JMP oswrch
 1560 :
 1570 .run_progs
 1580 LDY #0
 1590 LDX pr_root
 1600 BEQ rp_exit
 1610 .rp_loop1
 1620 LDA pr_len-1,X
 1630 BNE rp_notfin
 1640 LDA pr_next-1,X
 1650 STA pr_next-1,Y
 1660 TAX
 1670 BNE rp_loop1
 1680 BEQ rp_exit
 1690 .rp_notfin
 1700 LDA pr_wait-1,X
 1710 BNE rp_waiting
 1720 LDA ob_del_root
 1730 BEQ rp_nextiter
 1740 STX temp1
 1750 STY temp2
 1760 LDY temp1
 1770 JSR open_obj
 1780 LDX temp1
 1790 LDY temp2
 1800 CLC
 1810 LDA pr_char-1,X
 1820 ADC pr_dir-1,X
 1830 STA pr_char-1,X
 1840 DEC pr_len-1,X
 1850 LDA pr_delay-1,X
 1860 STA pr_wait-1,X
 1870 BEQ rp_loop1
 1880 .rp_waiting
 1890 DEC pr_wait-1,X
 1900 .rp_nextiter
 1910 TXA
 1920 TAY
 1930 LDX pr_next-1,Y
 1940 BNE rp_loop1
 1950 .rp_exit
 1960 RTS
 1970 :
 1980 .open_obj
 1990 TAX
 2000 LDA ob_next-1,X
 2010 STA ob_del_root
 2020 LDA ob_act_root
 2030 STA ob_next-1,X
 2040 STX ob_act_root
 2050 LDA #&FF
 2060 STA ob_lastx-1,X
 2070 LDA #0
 2080 STA ob_rel-1,X
 2090 LDA pr_routelo-1,Y
 2100 STA ob_routelo-1,X
 2110 LDA pr_routehi-1,Y
 2120 STA ob_routehi-1,X
 2130 LDA pr_strlo-1,Y
 2140 STA zp1
 2150 LDA pr_strhi-1,Y
 2160 STA zp1+1
 2170 LDA pr_char-1,Y
 2180 STA ob_offset-1,X
 2190 TAY
 2200 LDA (zp1),Y
 2210 STA ob_char-1,X
 2220 LDY #0
 2230 :
 2240 .open_line
 2250 STY temp3
 2260 LDA ob_routelo-1,X
 2270 STA zp1
 2280 LDA ob_routehi-1,X
 2290 STA zp1+1
 2300 LDY #0
 2310 LDA (zp1),Y
 2320 CMP #&FF
 2330 BNE ol_notshutd
 2340 LDY temp3
 2350 LDA ob_next-1,X
 2360 STA ob_next-1,Y
 2370 LDA ob_del_root
 2380 STA ob_next-1,X
 2390 STX ob_del_root
 2400 LDX ob_next-1,Y
 2410 SEC
 2420 RTS
 2430 .ol_notshutd
 2440 JSR get_cos
 2450 STA ob_x-1,X
 2460 TYA
 2470 STA ob_y-1,X
 2480 LDY #2
 2490 LDA (zp1),Y
 2500 CMP #&FF
 2510 BNE ol_notfin
 2520 LDA #1
 2530 STA ob_len-1,X
 2540 BNE ol_exit
 2550 .ol_notfin
 2560 JSR get_cos
 2570 STY temp4
 2580 LDY #1
 2590 SEC
 2600 SBC ob_x-1,X
 2610 BCS ol_gt1
 2620 EOR #&FF
 2630 ADC #1
 2640 LDY #&FF
 2650 .ol_gt1
 2660 STA ob_dx-1,X
 2670 TYA
 2680 STA ob_s1-1,X
 2690 LDA temp4
 2700 LDY #1
 2710 SEC
 2720 SBC ob_y-1,X
 2730 BCS ol_gt2
 2740 EOR #&FF
 2750 ADC #1
 2760 LDY #&FF
 2770 .ol_gt2
 2780 STA ob_dy-1,X
 2790 TYA
 2800 STA ob_s2-1,X
 2810 LDA ob_dx-1,X
 2820 CMP ob_dy-1,X
 2830 BCS ol_noswap
 2840 LDY ob_dy-1,X
 2850 STA ob_dy-1,X
 2860 TYA
 2870 STA ob_dx-1,X
 2880 .ol_noswap
 2890 STA ob_len-1,X
 2900 LDA #0
 2910 ROL A
 2920 STA ob_int-1,X
 2930 LDA ob_dx-1,X
 2940 LSR A
 2950 EOR #&FF
 2960 SEC
 2970 ADC ob_dy-1,X
 2980 STA ob_err-1,X
 2990 .ol_exit
 3000 CLC
 3010 LDA ob_routelo-1,X
 3020 ADC #2
 3030 STA ob_routelo-1,X
 3040 LDA ob_routehi-1,X
 3050 ADC #0
 3060 STA ob_routehi-1,X
 3070 LDY temp3
 3080 LDA ob_len-1,X
 3090 BNE ol_done
 3100 JMP open_line
 3110 .ol_done
 3120 CLC
 3130 RTS
 3140 :
 3150 .get_cos
 3160 AND #&7F
 3170 STA temp5
 3180 LDA (zp1),Y
 3190 ORA ob_rel-1,X
 3200 STA ob_rel-1,X
 3210 BPL gc_notoff
 3220 LDA temp5
 3230 CLC
 3240 ADC ob_offset-1,X
 3250 STA temp5
 3260 .gc_notoff
 3270 INY
 3280 LDA (zp1),Y
 3290 AND #&7F
 3300 TAY
 3310 LDA temp5
 3320 RTS
 3330 :
 3340 .run_objs
 3350 LDY #0
 3360 LDX ob_act_root
 3370 BEQ ro_exit
 3380 .ro_loop1
 3390 DEC ob_len-1,X
 3400 BNE ro_notdone
 3410 JSR open_line
 3420 BCS ro_check
 3430 BCC ro_nextobj
 3440 .ro_notdone
 3450 JSR step_point
 3460 .ro_nextobj
 3470 TXA
 3480 TAY
 3490 LDX ob_next-1,Y
 3500 .ro_check
 3510 BNE ro_loop1
 3520 .ro_exit
 3530 RTS
 3540 :
 3550 .step_point
 3560 LDA ob_err-1,X
 3570 BMI stp_nextbit
 3580 SEC
 3590 SBC ob_dx-1,X
 3600 STA ob_err-1,X
 3610 LDA ob_int-1,X
 3620 BNE stp_int1
 3630 CLC
 3640 LDA ob_x-1,X
 3650 ADC ob_s1-1,X
 3660 STA ob_x-1,X
 3670 JMP stp_nextbit
 3680 .stp_int1
 3690 CLC
 3700 LDA ob_y-1,X
 3710 ADC ob_s2-1,X
 3720 STA ob_y-1,X
 3730 .stp_nextbit
 3740 CLC
 3750 LDA ob_err-1,X
 3760 ADC ob_dy-1,X
 3770 STA ob_err-1,X
 3780 LDA ob_int-1,X
 3790 BNE stp_int2
 3800 CLC
 3810 LDA ob_y-1,X
 3820 ADC ob_s2-1,X
 3830 STA ob_y-1,X
 3840 RTS
 3850 .stp_int2
 3860 CLC
 3870 LDA ob_x-1,X
 3880 ADC ob_s1-1,X
 3890 STA ob_x-1,X
 3900 RTS
 3910 :
 3920 .theend
 3930 ]
 3940 P%=data%
 3950 [OPT opt%
 3960 .pr_root       EQUB 0
 3970 .pr_next       OPT FNds(maxprogs%)
 3980 .pr_wait       OPT FNds(maxprogs%)
 3990 .pr_delay      OPT FNds(maxprogs%)
 4000 .pr_dir        OPT FNds(maxprogs%)
 4010 .pr_len        OPT FNds(maxprogs%)
 4020 .pr_char       OPT FNds(maxprogs%)
 4030 .pr_strlo      OPT FNds(maxprogs%)
 4040 .pr_strhi      OPT FNds(maxprogs%)
 4050 .pr_routelo    OPT FNds(maxprogs%)
 4060 .pr_routehi    OPT FNds(maxprogs%)
 4070 :
 4080 .ob_del_root EQUB 0
 4090 .ob_act_root EQUB 0
 4100 .ob_next       OPT FNds(maxobjs%)
 4110 .ob_lastx      OPT FNds(maxobjs%)
 4120 .ob_lasty      OPT FNds(maxobjs%)
 4130 .ob_x          OPT FNds(maxobjs%)
 4140 .ob_y          OPT FNds(maxobjs%)
 4150 .ob_char       OPT FNds(maxobjs%)
 4160 .ob_err        OPT FNds(maxobjs%)
 4170 .ob_dx         OPT FNds(maxobjs%)
 4180 .ob_dy         OPT FNds(maxobjs%)
 4190 .ob_s1         OPT FNds(maxobjs%)
 4200 .ob_s2         OPT FNds(maxobjs%)
 4210 .ob_int        OPT FNds(maxobjs%)
 4220 .ob_len        OPT FNds(maxobjs%)
 4230 .ob_rel        OPT FNds(maxobjs%)
 4240 .ob_offset     OPT FNds(maxobjs%)
 4250 .ob_routelo    OPT FNds(maxobjs%)
 4260 .ob_routehi    OPT FNds(maxobjs%)
 4270 :
 4280 .temp1 EQUB 0
 4290 .temp2 EQUB 0
 4300 .temp3 EQUB 0
 4310 .temp4 EQUB 0
 4320 .temp5 EQUB 0
 4330 ]
 4340 NEXT
 4350 ENDPROC
 4360 :
 4370 DEF FNds(space%)
 4380 P%=P%+space%:O%=O%+space%
 4390 =opt%
 4400 :
 4410 DEF PROCcheck
 4420 total%=0
 4430 FOR a%=mem% TO mem%+theend-runanim
-1
 4440 total%=total%+?a%
 4450 NEXT
 4460 IF total%<>72204 PRINT"Checksum er
ror":VDU7:END
 4470 ENDPROC
```

Listing Info2

```
   10 REM     >CDdemo (Info2)
   20 REM By  Andrew Bennett
   30 REM For 8-bit machines
   40 REM (c) BAU June 1993
   50 :
   60 MODE7
   70 VDU 23,1,0;0;0;0;
   80 *LOAD CDcode
   90 PROCsetup
  100 PROCfrontpage
  110 REPEAT UNTIL GET=32
  120 PROCdemopage
  130 REPEAT UNTIL GET=32
  140 PROCendpage
  150 REPEAT UNTIL GET=32
  160 CLS
  170 END
  180 :
  190 DEF PROCsetup
  200 total%=0
  210 READ items%
  220 DIM data% &500,go%(items%-1)
  230 a%=data%
  240 FOR i%=0 TO items%-1
  250  go%(i%)=a%
  260  READ progs%
  270  ?a%=progs%
  280  total%=total%+progs%
  290  b%=a%+1:a%=a%+2*progs%+1
  300  FOR j%=0 TO progs%-1
  310   ?b%=a%:b%?1=a% DIV 256
  320   b%=b%+2
  330   REPEAT
  340    READ data$
  350    FOR k%=1 TO LEN data$-1 STEP 2
  360     ?a%=EVAL("&"+MID$(data$,k%,2))
  370     total%=total%+?a%
  380     a%=a%+1
  390    NEXT
  400   UNTIL data$="FF"
  410  NEXT
```

```
 420 NEXT
 430 IF total%<>57875 PRINT"Checksum er
ror - check data statements":VDU7:END
 440 ENDPROC
 450 :
 460 DEF PROCgo(g%)
 470 X%=go%(g%):Y%=go%(g%) DIV 256
 480 CALL &900
 490 ENDPROC
 500 :
 510 DEF PROCfrontpage
 520 CLS
 530 PRINTTAB(0,10)CHR$141
 540 PRINTTAB(0,11)CHR$141
 550 PRINTTAB(0,13)CHR$141
 560 PRINTTAB(0,14)CHR$141
 570 PROCgo(0):PROCgo(1)
 580 PROCgo(2)
 590 ENDPROC
 600 :
 610 DEF PROCdemopage
 620 CLS
 630 PRINTTAB(0,1)CHR$141
 640 PRINTTAB(0,2)CHR$141
 650 PROCgo(3):PROCgo(4)
 660 PROCgo(5):PROCgo(6)
 670 PROCgo(7):PROCgo(8)
 680 PROCgo(9):PROCgo(10)
 690 PROCgo(11):PROCgo(12)
 700 PROCgo(13)
 710 ENDPROC
 720 :
 730 DEF PROCendpage
 740 CLS
 750 PROCgo(14):PROCgo(15)
 760 PROCgo(16):PROCgo(17)
 770 PROCgo(18):PROCgo(19)
 780 ENDPROC
 790 :
 800 DATA 20
 810 :
 820 DATA 4
 830 DATA 0008FF05436861726100
 840 DATA 008F0A
 850 DATA FF
 860 DATA 08080104637465722700
 870 DATA 940A
 880 DATA FF
 890 DATA 0008FF05436861726100
 900 DATA 158F0B
 910 DATA FF
 920 DATA 08080104637465722715
 930 DATA 940B
 940 DATA FF
 950 :
 960 DATA 2
 970 DATA 0004010B44796E616E69
 980 DATA 6D61746F722703090307
 990 DATA 05070609081D081F0A1F
1000 DATA 0B1D0D8E0D
1010 DATA FF
1020 DATA 0004FF0B44796E616E69
1030 DATA 6D61746F7200181D181F
1040 DATA 161F151D130913071107
1050 DATA 10090E8E0E
1060 DATA FF
1070 :
1080 DATA 2
1090 DATA 0004FF0B507265737320
1100 DATA 535041434527010E0108
1110 DATA 02050403060109011003
1120 DATA 1305158816
1130 DATA FF
1140 DATA 0004010B746F20636F6E
1150 DATA 74696E7565000118011E
1160 DATA 02210423062509251023
1170 DATA 1321159416
1180 DATA FF
1190 :
1200 DATA 1
1210 DATA 00080115436861726163
1220 DATA 7465722044796E616E69
1230 DATA 6D61746F7226181F171D
1240 DATA 151D121C0F1A0C140B0F
1250 DATA 0C0F0E1311141310150C
1260 DATA 140D11150D180A180716
1270 DATA 0512051006 0F08110A13
1280 DATA 0A14098902
1290 DATA FF
1300 :
1310 DATA 2
1320 DATA 0804FF09436861726163
1330 DATA 74657200008901
1340 DATA FF
1350 DATA 0004010B44796E616E69
1360 DATA 6D61746F7227009301
1370 DATA FF
1380 :
1390 DATA 1
1400 DATA 00020122576974682020
1410 DATA 74686520204368617261
1420 DATA 63746572202044796E61
1430 DATA 6E696D61746F722C8318
1440 DATA 0305
1450 DATA FF
1460 :
1470 DATA 1
1480 DATA 0002FF226D6573736167
1490 DATA 65732063616E2074616B
1500 DATA 6520206F6E2020612020
1510 DATA 6C69666520206F668318
1520 DATA 0306
1530 DATA FF
1540 :
1550 DATA 1
1560 DATA 00020117746865697220
1570 DATA 6F776E2E20466F722065
1580 DATA 78616D706C653A831803
1590 DATA 07
1600 DATA FF
1610 :
1620 DATA 1
1630 DATA 0010010A53696E652057
1640 DATA 61766573271025 0C230A
1650 DATA 220A200C1C141A161916
1660 DATA 1714130C110A850A
1670 DATA FF
1680 :
1690 DATA 1
1700 DATA 0010010743697263 6C65
1710 DATA 73270D190D160E150F14
1720 DATA 11151316141915 1B151E
1730 DATA 141F1320111F0F1E0E1B
1740 DATA 0D850D
1750 DATA FF
1760 :
1770 DATA 1
1780 DATA 00100107537175617265
1790 DATA 7327120F120F18181818
1800 DATA 0A210A21108510
1810 DATA FF
1820 :
1830 DATA 3
1840 DATA 00040108496E20666163
1850 DATA 742C2712940C
1860 DATA FF
1870 DATA 0804010F616E79746869
1880 DATA 6E672020697320206127
1890 DATA 12940D
1900 DATA FF
1910 DATA 1004010C706F73736962
1920 DATA 696C6974792E2712940E
1930 DATA FF
1940 :
1950 DATA 1
1960 DATA 3210FF06616C6D6F7374
1970 DATA 2714041303120310040F
1980 DATA 0C0E100B140A1B0A9D0C
1990 DATA FF
2000 :
2010 DATA 2
2020 DATA 0004010B507265737320
2030 DATA 53504143450008 0E0812
2040 DATA 09130A13118815
2050 DATA FF
2060 DATA 0004FF0B746F20636F6E
2070 DATA 74696E75652708180814
2080 DATA 09130A13119415
2090 DATA FF
2100 :
2110 DATA 2
2120 DATA 0008010F2A2020202A20
2130 DATA 20202A202A2A2A2A2A13
2140 DATA 1813031202830B
2150 DATA FF
2160 DATA 0008FF102A2A2A2A2A20
2170 DATA 2A2020202A202A2A2A2A
2180 DATA 1418140315029 60B
2190 DATA FF
2200 :
2210 DATA 2
2220 DATA 0008010B2A2020202A20
2230 DATA 20202A202A1318130312
2240 DATA 02830A
2250 DATA FF
2260 DATA 0008FF112A2020202020
2270 DATA 2A20202A2A202A202020
2280 DATA 2A14181403150296 0A
2290 DATA FF
2300 :
2310 DATA 2
2320 DATA 0008010E2A2020202A2A
2330 DATA 2A2A2A202A2A2A2A1318
2340 DATA 130312028309
2350 DATA FF
2360 DATA 0008FF112A2A2A2A2020
2370 DATA 2A202A202A202A202020
2380 DATA 2A1418140315029609
2390 DATA FF
2400 :
2410 DATA 2
2420 DATA 0008010B2A2020202A20
2430 DATA 20202A202A1318130312
2440 DATA 028308
2450 DATA FF
2460 DATA 0008FF112A2020202020
2470 DATA 2A2A20202A202A202020
2480 DATA 2A1418140315029608
2490 DATA FF
2500 :
2510 DATA 2
2520 DATA 000801112A2A2A2A2A20
2530 DATA 2A2020202A202A2A2A2A
2540 DATA 2A131813031202 8107
2550 DATA FF
2560 DATA 0008FF102A2A2A2A2A20
2570 DATA 2A2020202A202A2A2A2A
2580 DATA 1418140315029607
2590 DATA FF
2600 :
2610 DATA 1
2620 DATA 0004FF15507265737320
2630 DATA 535041434520746F2066
2640 DATA 696E697368270D800E13
2650 DATA 0F0010131100121313 00
2660 DATA 140915
2670 DATA FF
```

Listing Info3

```
  10 REM     >CDexamp (Info3)
  20 REM By  Andrew Bennett
  30 REM For 8-bit machines
  40 REM (c) BAU June 1993
  50 :
  60 MODE 7
  70 *LOAD CDcode
  80 DIM anim% &100
  90 FOR opt%=0 TO 2 STEP 2
 100 P%=anim%:[OPT opt%
 110 EQUB 2         \ Number of programs
 120 EQUW prog1     \ Pointer to program
1
 130 EQUW prog2     \ Pointer to program
2
 140 :
 150 .prog1         \ Program 1
 160 EQUB 0         \ Initial delay (/50
seconds)
 170 EQUB 4         \ Subsequent delay (/
50 seconds)
 180 EQUB 1         \ Direction
 190 EQUB 9         \ String length
 200 EQUS "Character" \ String
 210 EQUB 20        \ First X coordinate
 220 EQUB 0         \ First Y coordinate
 230 EQUB 128+10    \ Second X coordinate
 and add in offset
 240 EQUB 12        \ Second Y coordinate
 250 EQUB &FF       \ End of path and pro
gram
 260 :
 270 .prog2         \ Program 2
 280 EQUB 0
 290 EQUB 4
 300 EQUB &FF
 310 EQUB 11
 320 EQUS "Dynanimator"
 330 EQUB 20
 340 EQUB 0
 350 EQUB 128+20
 360 EQUB 12
 370 EQUB &FF
 380 ]
 390 NEXT
 400 X%=anim%:Y%=anim% DIV 256
 410 CALL &900
 420 PRINT
 430 END
```

Listing Info4

```
  10 REM     >CDex2 (Info4)
  20 REM By  Dave Acton
  30 REM For 8-bit machines
  40 REM (c) BAU June 1993
  50 :
  60 MODE 7
  70 FOR y%=0 TO 24
  80  VDU 31,0,y%,129+y% MOD 6
  90 NEXT
 100 *LOAD CDcode
 110 DIM anim% &200
 120 s%=30
 130 FOR pass%=0 TO 2 STEP 2
 140 P%=anim%
 150 [OPT pass%
 160 EQUB 3
 170 EQUW prog1
 180 EQUW prog2
 190 EQUW prog3
 200 :
 210 .prog1
 220 EQUB 0
 230 EQUB 2
 240 EQUB 1
 250 EQUB 3
 260 EQUS "BBC"
 270 ]
 280 PROCrand_path(13,0)
 290 [OPT pass%
 300 .prog2
 310 EQUB 20
 320 EQUB 2
 330 EQUB 1
 340 EQUB 5
 350 EQUS "Acorn"
 360 ]
 370 PROCrand_path(17,1)
 380 [OPT pass%
 390 .prog3
 400 EQUB 40
 410 EQUB 2
 420 EQUB 1
 430 EQUB 4
 440 EQUS "User"
 450 ]
 460 PROCrand_path(23,2)
 470 NEXT pass%
 480 X%=anim%:Y%=anim% DIV 256
 490 CALL &900
 500 END
 510 :
 520 DEF PROCrand_path(finalx%,yoff%)
 530 x%=1
 540 FOR y%=20 TO 10 STEP -2
 550  P%?0=x%
 560  P%?1=y%+yoff%
 570  REPEAT
 580   x%=RND(39)
 590  UNTIL y%<>12 OR x%>finalx%+10
 600  IF y%=10 x%=128+finalx%
 610  P%?2=x%
 620  P%?3=y%+yoff%
 630  P%=P%+4
 640 NEXT
 650 ?P%=&FF
 660 P%=P%+1
 670 ENDPROC
```

Listing Info5

```
  10 REM     >FDModAsm (Info5)
  20 REM By  Simon Heys
  30 REM For 32-bit machines
  40 REM (c) BAU June 1993
  50 :
  60 MODE 0
  70 dirlist$="DirList"
  80 SYS "OS_File",5,dirlist$ TO type%,
,,room%
  90 IF type%<>1 ERROR 0,"Can't find "+
dirlist$
 100 croom%=room%+1024
 110 DIM code% croom%
 120 sp=13:link=14:pc=15
 130 FOR pass%=4 TO 6 STEP 2
 140 P%=0:O%=code%
 150 [OPT pass%
 160          EQUD    0
 170          EQUD    0
 180          EQUD    0
 190          EQUD    0
 200          EQUD    title
 210          EQUD    helpstring
 220          EQUD    helptable
 230          EQUD    0
 240          EQUD    0
 250          EQUD    0
 260          EQUD    0
 270
 280 .title
 290          EQUS    "DirectoryFinder"
 300          EQUB    0
 310          ALIGN
 320
 330 .helpstring
 340          EQUS    "DirectoryFinder"
 350          EQUB    9
 360          EQUS    "1.02 (29 Jul 1992
) by Simon Heys"
 370          EQUB    0
 380          ALIGN
 390
 400 .helptable
 410          EQUS    "FD"
 420          EQUB    0
 430          ALIGN
 440          EQUD    finddir
 450          EQUD    &00010001
 460          EQUD    fdsyntax
 470          EQUD    fdhelp
 480          EQUD    0
 490
 500 .fdhelp
 510          EQUS    "*FD changes direc
tory to one with the specified prefix."
 520          EQUB    13
 530          EQUB    10
 540 .fdsyntax
 550          EQUS    "Syntax: *FD <Dir
name|Dir name prefix>"
 560          EQUB    0
 570          ALIGN
 580
 590 .finddir
 600          LDR     r12,[r12]
 610          STMFD   (sp)!,{r0-r3 ,r14}
 620          MOV     r1,#0
 630          ADR     r3,s
 640 .getloop
 650          LDRB    r2,[r0],#1
 660          CMP     r2,#ASC "a"
 670          BLT     upper
 680          CMP     r2,#ASC "z"
 690          BGT     upper
 700          AND     r2,r2,#223
 710 .upper
 720          STRB    r2,[r3],#1
 730          ADD     r1,r1,#1
 740          CMP     r2,#32
 750          BGT     getloop
 760
 770          MOV     r0,#0
 780          SUB     r1,r1,#1
 790          SUB     r3,r3,#1
 800          STRB    r0,[r3]
 810          STRB    r1,l
 820          BL      find
 830          LDMFD   (sp)!,{r0-r3 ,pc}
 840
 850 .s       EQUS    STRING$(11,CHR$(0)
)
 860 .l       EQUB    0
 870          ALIGN
 880
 890 .find
 900          STMFD   (sp)!,{r0-r6 ,r14}
 910          ADR     r0,data
 920          ADR     r1,s
 930          LDRB    r6,l
 940 .loop1
 950          LDRB    r3,[r0],#1
 960          CMP     r3,#255
 970          BEQ     notfound
 980          CMP     r3,#ASC"."
 990          BNE     loop1
1000
1010          MOV     r4,#1
1020          MOV     r5,#0
1030 .checkloop
1040          LDRB    r2,[r1,r5]
1050          LDRB    r3,[r0],#1
1060          CMP     r3,#255
1070          BEQ     notfound
1080          CMP     r3,#ASC"a"
1090          BLT     up
1100          CMP     r3,#ASC"z"
1110          BGT     up
1120          AND     r3,r3,#223
1130 .up
1140          CMP     r3,r2
1150          BNE     loop1
1160          ADD     r5,r5,#1
1170          CMP     r5,r6
1180          BLT     checkloop
1190          SUB     r0,r0,#1
1200 .loop2
1210          LDRB    r3,[r0],#-1
1220          CMP     r3,#0
1230          BNE     loop2
1240          ADD     r0,r0,#2
1250          MOV     r1,r0
1260          SWI     "OS_WriteS"
1270          EQUS    CHR$(10)+"Director
y: "+CHR$(0)
1280          ALIGN
1290          SWI "OS_Write0"
1300          SWI     256+10:SWI 256+13
1310          MOV     r0,#0
1320          SWI     "OS_FSControl"
1330          LDMFD   (sp)!,{r0-r6 ,pc}
1340
1350 .notfound
1360          SWI     "OS_WriteS"
1370          EQUS    CHR$(10)+"Can't fi
nd '"+CHR$(0)
1380          ADR     r0,s
1390          SWI     "OS_Write0"
1400          SWI     "OS_WriteS"
1410          EQUS    "' in directory li
st"+CHR$(10)+CHR$(13)+CHR$(0)
1420          ALIGN
1430          LDMFD   (sp)!,{r0-r6 ,pc}
1440
1450 .data
1460 ]
1470 O%+=room%
1480 NEXT
1490 :
1500 SYS "OS_File",255,dirlist$,code%+d
ata
1510 SYS "OS_File",10,"FDMod",&FFA,,cod
e%,O%
1520 PRINT'"Module saved as 'FDMod'"
1530 END
```

Listing Info6

```
   10 REM     >MakeDList (Info6)
   20 REM By  Simon Heys
   30 REM For 32-bit machines
   40 REM (c) BAU June 1993
   50 :
   60 DIM data% 63,sd% 1000,store% 30*10
24
   70 MODE 0
   80 PROCcode
   90 PRINT"Directory list maker for 'FD
ModAsm'"'
  100 PRINT"Reading directory structure.
.."
  110 CALL readfiles
  120 SYS "OS_File",10,"DirList",&FFF,,s
tore%,!store
  130 PRINT'"List saved as 'DirList'"'
  140 END
  150 :
  160 DEF PROCcode
  170 DIM code% 1000
  180 sp=13:link=14:pc=15
  190 FOR pass%=0 TO 2 STEP 2
  200 P%=code%
  210 [OPT pass%
  220 .store  EQUD store%
  230 .dir    EQUD sd%
  240 .data   EQUD data%
  250 .find   EQUS "*"+CHR$0
  260         ALIGN
  270
  280 .readfiles
  290         STMFD   (sp)!,{r0-r12 ,link
}
  300         LDR     r12,dir
  310         LDR     r10,store
  320         MOV     r0,#ASC"$"
  330         STRB    r0,[r12],#1
  340         MOV     r0,#0
  350         STRB    r0,[r12],#1
  360         BL      examinedir
  370         MOV     r0,#255
  380         STRB    r0,[r10],#1
  390         STR     r10,store
  400         LDMFD   (sp)!,{r0-r12 ,pc}
  410
  420 .examinedir
  430         STMFD   (sp)!,{r0-r9 ,r11,l
ink}
  440         MOV     r4,#0
  450         LDR     r11,dir
  460         MOV     r0,r11
  470 .storestr
  480         LDRB    r1,[r0],#1
  490         STRB    r1,[r10],#1
  500         CMP     r1,#0
  510         BNE     storestr
  520 .while
  530         MOV     r0,#10
  540         MOV     r1,r11
  550         LDR     r2,data
  560         MOV     r3,#1
  570         MOV     r5,#63
  580         ADR     r6,find
  590         SWI     "OS_GBPB"
  600         CMP     r3,#0
  610         BEQ     donext
  620         LDR     r0,data
  630         LDR     r1,[r0,#&10]
  640         CMP     r1,#2
  650         BNE     donext
  660         MOV     r0,r11
  670         MOV     r9,r12
  680 .transloop
  690         LDRB    r1,[r0],#1
  700         STRB    r1,[r12],#1
  710         CMP     r1,#0
  720         BNE     transloop
  730         SUB     r12,r12,#1
  740         MOV     r1,#ASC"."
  750         STRB    r1,[r12],#1
  760         LDR     r0,data
  770         ADD     r0,r0,#&14
  780 .transloop1
  790         LDRB    r1,[r0],#1
  800         STRB    r1,[r12],#1
  810         CMP     r1,#0
  820         BNE     transloop1
  830         STR     r9,dir
  840         BL      examinedir
  850         MOV     r12,r9
  860 .donext
  870         CMN     r4,#1
  880         BNE     while
  890         LDMFD   (sp)!,{r0-r9 ,r11,p
c}
  900 ]
  910 NEXT
  920 ENDPROC
```

Listing Info7

```
   10 REM     >!RunImage (Info7)
   20 REM     For !WindMove
   30 REM By  Andrew Cumming
   40 REM For 32-bit machines
   50 REM (c) BAU June 1993
   60 :
   70 PROCinit
   80 ON ERROR !b=ERR:$(b+4)=REPORT$:SYS
 "Wimp_ReportError",b,1,"WindowMove"
   90 REPEAT
  100  SYS "Wimp_Poll",&132,b TO a%
  110  CASE a% OF
  120   WHEN 0:
  130    SYS "Wimp_GetPointerInfo",,b
  140    IF b!12>-1 AND b!16=-1 AND NOT
my_ptr AND mode>0 THEN
  150     SYS "OS_SpriteOp",36+256,s,"pt
r_hand",2,0,0,0,0
  160     my_ptr=TRUE
  170    ENDIF
  180    IF (b!16<>-1 OR b!12<0) AND my_
ptr THEN
  190     SYS "Wimp_SpriteOp",36,,"ptr_d
efault",1,0,0,0,0
  200     my_ptr=FALSE
  210     ENDIF
  220    IF b!8>0 AND (b!8 AND 2)=0 AND
my_ptr THEN
  230     b!4=mode:!b=b!12:SYS "Wimp_Dra
gBox",,b
  240    ENDIF
  250   WHEN 6:
  260    CASE b!8 OF
  270     WHEN 2:
  280      $m="WindowMove"
  290      m!12=&70207
  300      m!16=140
  310      m!20=44
  320      m!24=0
  330      m!28=&80
  340      m!32=0
  350      m!36=&7000021
  360      $(m+40)="Quit"
  370      SYS "Wimp_CreateMenu",,m,!b-7
0,140
  380     WHEN 1,4:
  390      mode+=1
  400      IF mode>4 OR b!8=1 mode=0
  410      $sname="!windmove"+STR$mode
  420      !b=-2
  430      b!4=myicon%
  440      b!8=0
  450      b!12=0
  460      SYS "Wimp_SetIconState",,b
  470    ENDCASE
  480   WHEN 9:
  490    quit%=(!b=0)
  500   WHEN 17,18:
  510    quit%=(b!16=0)
  520  ENDCASE
  530 UNTIL quit%
  540 SYS "Wimp_CloseDown"
  550 END
  560 :
  570 DEF PROCinit
  580 SYS "Wimp_Initialise",200,&4B53415
4,"WindowMove"
  590 DIM b 99,m 99,sname 15
  600 quit%=FALSE
  610 mode=0
  620 my_ptr=FALSE
  630 SYS "XOS_File",5,"<WindMove$Dir>.S
prites" TO ,,,,slen%
  640 DIM s slen%+4
  650 !s=slen%+4
  660 SYS "OS_SpriteOp",10+256,s,"<WindM
ove$Dir>.Sprites"
  670 !b=-1
  680 b!4=0
  690 b!8=0
  700 b!12=68
  710 b!16=68
  720 b!20=&310A
  730 b!24=sname
  740 b!28=s
  750 b!32=12
  760 $sname="!windmove0"
  770 SYS "Wimp_CreateIcon",,b TO myicon
%
  780 ENDPROC
```

Listing Info8

```
   10 REM     >WMdat (Info8)
   20 REM     Create files for !WindMove
   30 REM     Files created by Andrew Cu
mming
   40 REM For 32-bit machines
   50 REM (c) BAU June 1993
   60 :
   70 free%=(HIMEM-END-&8000) AND &FFFFF
000
   80 DIM q% &100,w% free%
   90 REPEAT
  100  READ file$
  110  IF file$<>"*" THEN
  120   PRINT file$
  130   READ type%,olen%
  140   IF type%=&FFF OR type%=&FFE OR t
ype%=&FEB THEN
  150    out%=OPENOUT(file$)
  160    REPEAT
  170     READ line$
  180     IF line$<>"*" BPUT#out%,line$
  190    UNTIL line$="*"
  200    CLOSE#out%
  210    SYS "OS_File",18,file$,type%
  220   ELSE
  230    line%=0
  240    d$=""
  250    i%=0
  260    WHILE i%<olen%
  270     b$=FNc
  280     IF b$>="a" AND b$<="z" THEN
  290      off%=-EVAL("&"+FNc+FNc)
  300      FOR k%=0 TO (ASC(b$)-ASC"a"+2
)
  310       w%?i%=w%?(i%+off%)
  320       i%+=1
  330      NEXT
  340     ELSE
  350      w%?i%=EVAL("&"+b$+FNc)
  360      i%+=1
  370     ENDIF
  380    ENDWHILE
  390    SYS "OS_File",10,file$,type%,,w
%,w%+olen%
  400   ENDIF
  410  ENDIF
  420 UNTIL file$="*"
  430 END
  440 :
  450 DEF FNc
  460 LOCAL c$
  470 IF d$="" THEN
  480  READ d$,ch$
  490  line%+=1
  500  $q%=d$
  510  SYS "OS_CRC",0,q%,q%+LEN(d$),1 TO
 crc%
  520  IF crc%<>EVAL("&"+ch$) PRINT"Erro
r in data line ";line%:END
  530 ENDIF
  540 c$=LEFT$(d$,1)
  550 d$=MID$(d$,2)
  560 =c$
  570 :
  580 DATA "!Run",&FEB,&8E
  590 DATA |!Run for !windmove
  600 DATA |
  610 DATA WimpSlot -min 16K -max 16K
  620 DATA Set WindMove$Dir <Obey$Dir>
  630 DATA IconSprites <WindMove$Dir>.!S
prites
  640 DATA Run <WindMove$Dir>.!RunImage
  650 DATA *
  660 DATA "!Sprites",&FF9,&2E0
  670 DATA 0100000010a04E4020000D4,5270
  680 DATA a042177696E646D6F7665a1,CB02
  690 DATA 804e1Ca230007a282Ca2C80,B4BB
  700 DATA a310Ce14b0F88h0Cf168888,7ED8
  710 DATA 08p13q15n3C77777777a04b,96F4
  720 DATA 07h14CC77CCCCCCCa06f14,DC5
  730 DATA 88k28c7Fa857711111111a0,A252
  740 DATA 47722a14b7Fa72i14a80u28,1CF9
  750 DATA r50b8C2222222a04h78tA0,2989
  760 DATA rC8vF0p13s3C00F0FFfFFFF,CC10
  770 DATA FFf0BFFFF0Fn14a1Df15h28,F5D1
  780 DATA n3Cb25b29g0Eq14FF00FFk2,2E6C
  790 DATA 8c0Ea85k140Fi4Ai55s28r5,177D
  800 DATA 0z8CmA0rC8vF0g13u3CFF,55A
  810 DATA "Sprites",&FF9,&EEC
  820 DATA 0600000010a04F00E0000D4,7C83
  830 DATA 0200002177696E646D6F766,CEEE
  840 DATA 530000004e1Ca230007a282,6B3B
  850 DATA Ca2C800100000Ce14a3B404,2A89
  860 DATA 4h0Cf164444b39m13q15n3C,5336
  870 DATA 33333333a04b07h14223322,1BC7
  880 DATA 222222a06f1444k28c7Fa85,8A83
  890 DATA 3311111111a04b28c7Fa72i,402
  900 DATA 14a80u28r50c78c77i78tA0,D8D
  910 DATA rC8vF0p13s3C00F0FFfFFFF,CC10
  920 DATA FFf0BFFFF0Fn14a1Df15h28,F5D1
  930 DATA n3Cb25b29g0Eq14FF00FFk2,2E6C
  940 DATA 8c0Ea85k140Fi4Ai55s28r5,177D
  950 DATA 0z8CmA0rC8vF0g13v3CD402,D5FD
  960 DATA 0000217769666D6F76653,1A89
  970 DATA 1000004aF310e6507aFF2Ca,9E34
  980 DATA 99800100000Cf70a0F88h0C,7ABF
  990 DATA f86888808p13q15n3C77777,E5A2
 1000 DATA 777a04b07h14CC77CCCCCCC,2B86
 1010 DATA Ca06f1488k28c7Fa8533111,E439
 1020 DATA 11111a04332233000c7Fa72i,D756
 1030 DATA 14a80u28a503333333a04b,FBCA
 1040 DATA 07d50aF7332222222a04b5,405B
 1050 DATA 0fEEj28zC8vF0p13s3C00F0,F1C8
 1060 DATA FFfFFFFFFf0BFFFF0Fn14a1,4EE2
 1070 DATA Df15h28n3Cb25b29g0Eq14F,7408
 1080 DATA F00FFk28c0Ea85k140Fi4Ai,1C5D
 1090 DATA 55s28r50z8CmA0rC8vF0g13,C293
 1100 DATA v3CD4020000217769666D,5861
 1110 DATA 6F766532000004aF310e650,549
 1120 DATA 7aFF2Ca99800100000Cf700,28F7
 1130 DATA 0004044h0Cf864444b39m13,30B3
 1140 DATA q15n3C33333333a04b07h14,83D3
 1150 DATA 22332222222a06f1444k28,EA62
 1160 DATA 88e8533111111111a04b2888,C804
 1170 DATA 08d72i148888b29r2815077,B98
 1180 DATA 7777d50c78c772277CC77oA,88E0
 1190 DATA 0b28jF680f35hF6a70d5E11,6A24
 1200 DATA 5o13r3C00F0FFfFFFFFFf0B,F694
 1210 DATA FFFF0Fn14a1Df15h28n3Cb2,C022
 1220 DATA 5b29g0Eq14FF00FFk28c0Ea,7C9
 1230 DATA 85k140Fi4Ai55s28r50z8Cm,B539
 1240 DATA A0rC8vF0g13v3CD40200002,ECBE
 1250 DATA 177696E646D6F7665330000,8318
 1260 DATA 04aF310e6507aFF2Ca99800,DDFC
 1270 DATA 100000Cf7000004044h0Cf8,58EB
 1280 DATA 64444b39m13q15n3C333333,DD88
 1290 DATA 33a04b07h14223322222222,4541
 1300 DATA a06f1488k2888bFB80a1411,CA2B
 1310 DATA 111111a04b288808b278888,35FB
 1320 DATA i14a0Eu28a5077777777a04,8E06
 1330 DATA 7777f50aF777c76222277g7,BC3B
 1340 DATA 8a14i28zC8vF0p13s3C00F0,AC95
 1350 DATA FFfFFFFFFf0BFFFF0Fn14a1,4EE2
 1360 DATA Df15h28n3Cb25b29g0Eq14F,7408
 1370 DATA F00FFk28c0Ea85k140Fi4Ai,1C5D
 1380 DATA 55s28r50z8CmA0rC8vF0g13,C293
 1390 DATA v3CD4020000217769666D,5861
 1400 DATA 6F766534000004aF310e650,A7CA
 1410 DATA 7aFF2Ca99800100000Cf70a,D436
 1420 DATA 0F88h0Cf868888808p13q15n,ADAA
 1430 DATA 3C33333333a04b07h142233,860D
 1440 DATA 2222222a06f1444g287777,AF18
 1450 DATA 77a0EaFC40a141111111a0,B308
 1460 DATA 47722a14bB8444444i14a0E,103E
 1470 DATA u28r50c78c77i78tA0rC8vF,2D2F
 1480 DATA 0p13s3C00F0FFfFFFFFFf0B,28F8
 1490 DATA FFFF0Fn14a1Df15h28n3Cb2,C022
 1500 DATA 5b29g0Eq14FF00FFk28c0Ea,7C9
 1510 DATA 85k140Fi4Ai55s28r50z8Cm,B539
 1520 DATA A0rC8vF0g13v3CBCaF77074,79AF
 1530 DATA 725F68616E64b5C01aF311e,1FCD
 1540 DATA 6503aFF2Ca99a040008c795,F36A
 1550 DATA 5d7F546915c88A4691Ae085,3A78
 1560 DATA A05d109A06b1FA5d08A4e08,20D7
 1570 DATA A4A6AAe08AAAAb2094AAd08,174A
 1580 DATA 90a08b3850a10b7840A9AA6,D561
 1590 DATA Ab8000A5AA6AcE894AA5AcF,9DE5
 1600 DATA 090AAd685055d78dFC00,F14A
 1610 DATA *
```

Listing Info9

```
   10 REM     >Mira (Info9)
   20 REM By  John Williams
   30 REM For all machines
   40 REM (c) BAU June 1993
   50 :
   60 mode=12 : REM 20 for multiscan mon
itors, 2 for 8-bit machines
   70 :
   80 MODE 0
   90 PROCread_data
  100 eg=FNchoose
  110 MODE mode
  120 VDU 23;8202;0;0;0;0;
  130 PROCplot(eg)
  140 END
  150 :
  160 DEF PROCread_data
  170 READ gs
  180 DIM g$(gs),f$(gs)
  190 FOR i=1 TO gs
  200  READ g$(i),f$(i)
  210 NEXT
  220 READ egs
  230 DIM eg$(egs),g(i),A(egs),B(egs),X(
egs),Y(egs),x0(egs),y0(egs),sc(egs)
  240 FOR i=1 TO egs
  250  READ eg$(i),g(i),A(i),B(i),X(i),Y
(i),x0(i),y0(i),sc(i)
  260 NEXT
  270 ENDPROC
  280 :
  290 DEF FNchoose
  300 PRINTTAB(3);"Example";TAB(15);"G-f
unction";TAB(35);"A";TAB(45);"B";TAB(55)
;"x(0) y(0) xc   yc   size"'
  310 FOR i=1 TO egs
  320  PRINT;i;") ";eg$(i);TAB(15);g$(g(
i));TAB(35);A(i);TAB(45);B(i);TAB(55);X(
i);TAB(60);Y(i);TAB(65);x0(i);TAB(70);y0
(i);TAB(75);sc(i)
  330 NEXT
  340 PRINT '"Choose:";
  350 REPEAT
  360  key=GET-48
  370 UNTIL key>0  AND key<=egs
  380 =key
  390 :
  400 DEF PROCplot(eg)
  410 CLS
  420 A=A(eg):B=B(eg):x=X(eg):y=Y(eg):s=
sc(eg):g$=f$(g(eg))
  430 VDU 29,x0(eg);y0(eg);
  440 f=(1-A)*x+2*A*(1-EVALg$)
  450 FOR i=0 TO 13000
  460  IF i>100 GCOL 0,INT(i/3000)+1:PLO
T 69,x*s,y*s
  470  z=x
  480  x=f+B*y
  490  f=(1-A)*x+2*A*(1-EVALg$)
  500  y=f-z
  510 NEXT
  520 ENDPROC
  530 :
  540 REM G functions:
  550 DATA 8
  560 DATA "1 RESTORE (1+xRAD)","1/(1+x*
x)"
  570 DATA "x RESTORE (1+xRAD)","x/(1+x*
x)"
  580 DATA "1 RESTORE AND(1+xRAD)","1/SQ
R(1+x*x)"
  590 DATA "sin x RESTORE (1+xRAD)","SIN
x/(1+x*x)"
  600 DATA "x RESTORE (1+sgn x.xRND)","x
/(1+SGNx*x^3)"
  610 DATA "xRAD RESTORE (1+sgn x.xRND)"
,"x*x/(1+x^3*SGNx)"
  620 DATA "x.e[-abs x]","x*EXP(-ABSx)"
  630 DATA "x.sin x.e[-abs x]","x*SINx*E
XP(-ABSx)"
  640 :
  650 REM Examples:
  660 DATA 8
  670 DATA Bow,     4,1.49,1,      5, 0,
550,550,30
  680 DATA Toy,     1,0.69,1,     12, 0,
600,500,15
  690 DATA Petals,  5,0.77,1,      3, 7,
550,550,30
  700 DATA Urchin,  1,0.67,1,     -5, 0,
550,500,40
  710 DATA Brooch,  1,0.72,1,      5, 5,
580,500,45
  720 DATA Crochet, 4,0.27,0.9998, 2,10,
600,550,42
  730 DATA Fishbone,1,1.55,0.9985, 4,10,
500,550,30
  740 DATA Wings,   1,1.48,0.93,   4, 0,
600,600,50
```

Listing Info10

```
   10 REM     >Mould (Info10)
   20 REM By  David Llewellyn-Jones
   30 REM For 32-bit machines
   40 REM (c) BAU June 1993
   50 :
   60 ON ERROR IFERR<>17 PRINTREPORT$;"
at line ";ERL:END ELSE END
   70 PROCcode
   80 MODE 0
   90 PRINT"Choose mould program:"'
  100 PRINT"1. Mouldy mouse"
  110 PRINT"2. Full screen of various mo
uld varieties"
  120 PRINT"3. Random specks of mould on
 screen"
  130 PRINT"4. Mould in a grid"
  140 PRINT"5. Lines of mould"
  150 PRINT"6. Load a screen and draw"
  160 PRINT'"Press 1-6 to start...";
  170 REPEAT
  180  c$=GET$
  190 UNTIL c$>="1" AND c$<="6"
  200 ON ERROR IFERR<>17 PRINTREPORT$;"
at line ";ERL:END ELSE RUN
  210 MODE13:OFF
  220 CLS
  230 CALL init
  240 CASE c$ OF
  250  WHEN "1":PROCdraw
  260  WHEN "2":PROCwipe:PROCgrow
  270  WHEN "3":PROCdots:PROCgrow
  280  WHEN "4":PROCgrid:PROCgrow
  290  WHEN "5":PROClines:PROCgrow
  300  WHEN "6":PROCload:PROCdraw
  310 ENDCASE
  320 END
  330 :
  340 DEF PROCload
  350 INPUT"Screen to load ";screen$
  360 SYS "OS_CLI","ScreenLoad "+screen$
  370 ENDPROC
  380 :
  390 DEF PROCdraw
  400 *POINTER 1
  410 REPEAT
```

```
420  C%=RND(50)+5
430  D%=(D%+1)MOD320
440  CALL startup
450  MOUSE X,Y,Z
460  IF Z AND 1 GCOL0TINT0:CIRCLEFILLX
,Y,96:GCOLRND(64)TINTRND(256)
470  IF Z AND 4 CIRCLE FILLX,Y,6
480  IF Z AND 2 GCOLRND(64)TINTRND(256
)
490 UNTIL FALSE
500 ENDPROC
510 :
520 DEF PROCwipe
530 C%=0
540 T%=0
550 FOR x=0 TO 12 STEP 4
560  FOR y=0 TO 1023 STEP 4
570   T%+=16
580   GCOL C% TINT T%
590   IF T%>255 T%=0:C%+=1:IF C%>63 C%
=0
600   POINT x,y
610  NEXT
620 NEXT
630 FOR x=16 TO 1280 STEP 16
640  RECTANGLE 0,0,16,1024 TO x,0
650 NEXT
660 ENDPROC
670 :
680 DEF PROCdots
690 C%=0:T%=0
700 FOR n=1 TO 50
710  GCOL RND(64) TINT RND(256)
720  POINT RND(1280),RND(1024)
730 NEXT
740 ENDPROC
750 :
760 DEF PROCgrid
770 g%=RND(80)+10
780 c%=0
790 FOR x=0 TO 1280 STEP g%
800  FOR y=16 TO 1007 STEP g%
810   c%+=1:IF c%>63 c%=1
820   GCOL c%
830   POINT x,y
840  NEXT
850 NEXT
860 ENDPROC
870 :
880 DEF PROClines
890 FOR n=0 TO 30
900  GCOL RND(64)TINTRND(256)
910  LINE RND(1280),RND(1024),RND(1280
),RND(1024)
920 NEXT
930 ENDPROC
940 :
950 DEF PROCgrow
960 REPEAT
970  C%=RND(50)+10
980  D%=(D%+1)MOD320
990  CALL startup
1000 UNTIL0
1010 ENDPROC
1020 :
1030 DEF PROCcode
1040 DIM code2% 1500
1050 link=14:pc=15
1060 top=11
1070 rnd1=3
1080 temp=5
1090 point=6
1100 colour=7
1110 point2=8
1120 return=9
1130 rnd2=2
1140 tint=10
1150 FORpass%=0TO2STEP2
1160 P%=code2%
1170 [OPTpass%
1180 .vdu
1190 EQUD 148
1200 EQUD -1
1210 .vdu2
1220 EQUD 0
1230 .init
1240 ADR 0,vdu
1250 ADR 1,vdu
1260 SWI "OS_ReadVduVariables"
1270 LDR point,vdu
1280 ADD top,point,#81920
1290 SUB top,top,#640
1300 STR top,vdu2
1310 ADD point,point,#320
1320 STR point,vdu
1330 MOV rnd1,#1
1340 MOV pc,link
1350 .startup
1360 MOV return,link
1370 LDR point,vdu
1380 LDR top,vdu2
1390 ADD point,point,rnd1
1400 .loop
1410 ADD point,point,rnd2
1420 LDRB colour,[point]
1430 MOV colour,colour,LSR#2
1440 CMP colour,#0
1450 BLNE direct
1460 ADDNE colour,tint,colour,LSL#2
1470 STRNEB colour,[point2]
1480 CMP point,top
1490 BLT loop
1500 MOV pc,return
1510 .direct
1520 SUBS tint,tint,#1
1530 MOVLT tint,#3
1540 MOV point2,point
1550 LDRB temp,[point2,#1]!
1560 CMP colour,temp,LSR#2
1570 MOVNE pc,link
1580 LDRB temp,[point2,#-2]!
1590 CMP colour,temp,LSR#2
1600 MOVNE pc,link
1610 LDRB temp,[point2,#321]!
1620 CMP colour,temp,LSR#2
1630 MOVNE pc,link
1640 LDRB temp,[point2,#-640]!
1650 CMP colour,temp,LSR#2
1660 MOV pc,link
1670 ]NEXTpass%
1680 ENDPROC
```

Listing Info11

```
10 REM     >Distort (Info11)
20 REM By  David Jeffries
30 REM For 32-bit machines
40 REM (c) BAU June 1993
50 :
60 MODE 15
70 DIM sprite 162*1024
80 *Cat
90 INPUT'"Sprite file   : "spr$
100 INPUT'"Radius        : "radius
110 SYS "OS_File",&FF,spr$,sprite
120 PROCmakeshape
130 PRINT'"Mouse control : ";
140 mc=(INSTR(" YyNn",GET$)DIV2=1)
150 IF mc PRINT"Yes"' ELSE PRINT"No"'
160 PROCassembler
170 CLS:OFF
180 CALLcode
190 END
200 :
210 DEF PROCassembler
220 DIM code 1000
230 FOR pass=0 TO 2 STEP2
240 P%=code
250 [OPT pass
260 MOV R0,#0
270 LDR R7,pos
280 LDR R8,coord2
290 LDR R9,coord1
300 LDR R10,scstart
310 LDR R11,image
320 LDR R12,length
330 SUB R11,R11,R12
340 SUB R10,R10,R12
350 ADD R10,R10,R7
360 LDR R4,end
370 ADD R4,R4,R9
380 .inloop
390 LDR R8,coord2
400 LDR R9,coord1
410 .loop
420 LDR R2,[R8],#4
430 ADD R3,R11,R7
440 ADD R2,R2,R3
450 LDR R2,[R2]
460 LDR R1,[R9],#4
470 ADD R1,R1,R10
480 STR R2,[R1]
490 STR R2,[R1,#4]
500 STR R2,[R1,#8]
510 STR R2,[R1,#640]
520 STR R2,[R1,#644]
530 STR R2,[R1,#648]
540 STR R2,[R1,#1280]
550 STR R2,[R1,#1284]
560 STR R2,[R1,#1288]
570 STR R2,[R1,#1920]
580 STR R2,[R1,#1924]
590 STR R2,[R1,#1928]
600 CMP R9,R4
610 BLT loop
620 LDR R8,mouse
630 CMP R8,#0
640 ADDEQ R7,R7,#4
650 BEQ nomouse
660 ADR R8,buf
670 STMIA R8,{r0-r1 ,R4-R7,R9-R12}
680 SWI "OS_Mouse"
690 LDR R4,oldx
700 SUB R2,R0,R4
710 STR R0,oldx
720 ADR R8,buf
730 LDMIA R8,{r0-r1 ,R4-R7,R9-R12}
740 SUB R7,R7,R2
750 .nomouse
760 MOV R0,#0
770 SWI "OS_ReadEscapeState"
780 BCC inloop
790 MOV PC,R14
800 :
810 .coord1  EQUD data1+8
820 .coord2  EQUD data2
830 .scstart EQUD 148
840          EQUD -1
850 .image   EQUD sprite+sprite!44
860 .length  EQUD &28000 DIV 2
870 .end     EQUD !data1
880 .pos     EQUD 320
890 .oldx    EQUD 640
900 .mouse   EQUD ABSmc
910 .buf
920 ]:NEXT
930 SYS "OS_ReadVduVariables",scstart,
scstart
940 ENDPROC
950 :
960 DEF PROCmakeshape
970 PRINT
980 size=((radius/4)^2+512)
990 DIM data1 size,data2 size
1000 counter=0
1010 r=1:r2=1:c=0.1
1020 REPEAT
1030  FOR a=0 TO PI*2 STEP PI/(r/4)
1040   x=r*COSa:y=r*SINa:x2=r2*COSa:y2=
r2*SINa
1050   addr1=&28000-(640*INT(y/4))+(x/2
)
1060   addr2=&28000-(640*INT(y2/4))+(x2
/2)
1070   data1!counter=addr1
1080   data2!counter=addr2
1090   counter+=4
1100  NEXT
1110  r+=16
1120  c+=(SIN(PI/2)*(r/radius))
1130  r2+=4+c
1140  PRINT"Please wait   : ";(radius>r
)*(r-radius);"  ";CHR$13;
1150 UNTIL r>radius
1160 !data1=(counter-SQR(counter))
1170 data1!4=(data2-data1)
1180 PRINT
1190 ENDPROC
```

Listing Info12

```
10 REM     >Bell7/1 (Info12)
20 REM By  Dave Lawrence
30 REM For All machines
40 REM (c) BAU June 1993
50 :
60 INPUTb,c$,w:DIMn 50,q 8:$n=STRING$
(2,"1}2u3q4i5a6]7U8L9D0@E8T0 "):h=n+24:c
=1:REPEATu=2-u:d=INSTR(c$,".",c):FORi=1T
Ob*2STEP2:j=i-1:VDU9,n?j:SOUND1,-15,n?i,
w:WIDTHINKEY(w*5):h?j=INSTR(MID$(c$,c,d-
c),CHR$h?i):g=u ANDINKEYTRUE ORg:NEXT:c=
d+1:i=2:REPEATj=i-2:!q=n!j:q!4=!q:s=-g*(
h?i=h?j):n!j=q!s:i=i+2+s:UNTILi>=b*2:WID
THINKEY(u*w):PRINT:VDU5*u:UNTIL0
```

Listing Info13

```
10 REM     >IceTrain/1 (Info13)
20 REM By  Richard Wilkie
30 REM For All machines
40 REM (c) BAU June 1993
50 :
60 MODE 12:OFF:A=0:FOR B=1TO900STEP0.
1:A+=1:X=640+SINRAD(A)*B:Y=512+COSRAD(A)
*B:G=A MOD15:GCOL0,G+1:CIRCLEFILL X,Y,10
0:NEXT:REPEAT:A+=1:A=A MOD 15:FOR B=1TO1
5:COLOUR B,(A+B)*16,0,0:NEXT:UNTIL 0
```

Listing Info14

```
10 REM     >Orblet/1 (Info14)
20 REM By  Robbie Davies
30 REM For 32-bit machines
40 REM (c) BAU June 1993
50 :
60 MODE15:GCOL3,59:D=32:T=30:DIMD(4):
REPEATS=S MOD4+1:X=X+D:CIRCLEX,99,32:REC
TANGLEFILLRND(800),992,99,-(RND(T)=1)*32
:MOUSEQ,W,B:WAIT:CIRCLEX,99,32:PRINTTAB(
0,S-1)CHR$11:D-=2:D(2)=D:D(1)=-D+(D/4)-(
B=4)*20:D=D((X<0)+2):X+=(X<0)*X:T-=.01:U
NTILPOINT(X,92)=59:PRINT100-T*3
```

Listing Info15

```
10 REM     >Tune/1 (Info15)
20 REM By  Robbie Davies
30 REM For 32-bit machines
40 REM (c) BAU June 1993
50 :
60 VOICES4:FORI=1TO4:OSCLI("Channel.
"+STR$I+" 2"):NEXT:DIMV(3):B$="047772904
447590772047772":R=0:REPEATFORT=1TO24STE
P3:FORV=0TO3:V(V)=VALMID$(B$,V+T,1):NEXT
:FORI=1TO8:FORN=0TO2:SOUNDN+1,-7,V(N)*4+
(N>0)*-48,9:NEXT:SOUND4,R,V(INT((I+1)/2)
-1)*4+96,9:A=INKEY23:NEXT,:R=-9:UNTIL0
```

Listing Info16

```
10 REM     >Lives32 (Info16)
20 REM     Life for two challenge
30 REM By  Dave Acton
40 REM For 32-bit machines
50 REM (c) BAU June 1993
60 :
70 MODE 9
80 OFF
90 size%=5
100 max%=255
110 max_turn%=100
120 time_limit%=18000
130 DIM proc$(max%),file$(max%),score(
max%),seen%(max%),player$(max%)
140 DIM c%(2),board% size%*size%,new%
size%*size%,games(2),who%(2),time_left%(
2)
150 DIM temp% &1000,str% &100
160 SYS "OS_GBPB",9,"procs",temp%,256,
0,&1000,"*" TO ,,,players%
170 p%=temp%
180 FOR i%=0 TO players%-1
190  p2%=p%
200  WHILE ?p2%<>0
210   p2%+=1
220  ENDWHILE
230  ?p2%=13
240  player$(i%)=LEFT$($p%+STRING$(10,
" "),10)
250  proc$(i%)=FNlc($p%)
260  file$(i%)="procs."+proc$(i%)
270  p%=p2%+1
280 NEXT
290 OVERLAY file$()
300 to_play%=10
310 score()=0
320 display%=TRUE
330 FOR i%=0 TO players%-1
340  dummy%=EVAL("FN"+proc$(i%)+"(0,0,
-1,size%,0,0)")
350 NEXT
360 FOR who%(1)=0 TO players%-2
370  FOR who%(2)=who%(1)+1 TO players%
-1
380   games()=0
390   first%=1
400   last%=2
410   FOR game%=1 TO to_play%
420    PROCcentre("Life for two challe
nge",0,7)
430    PRINTTAB(0,2)SPC40
440    PROCcentre(proc$(who%(1))+" vs
"+proc$(who%(2)),2,6)
450    PROCgames_won
460    FOR i%=0 TO size%*size%-1
470     board%?i%=0
480    NEXT
490    PROCshow_board
500    turn%=1
510    game_over%=FALSE
520    foul%=-1
530    time_left%()=time_limit%
540    REPEAT
550     IF turn%>3 PROClife
560     IF (FNcount(1)>0 AND FNcount(2
)>0) OR turn%<4 THEN
570      FOR player%=first% TO last% S
TEP SGN(last%-first%)
580       PROCturn(player%,turn%)
590      NEXT
600      turn%+=1
610     ELSE
620      game_over%=TRUE
630     ENDIF
640     PROCshow_board
650     g$=INKEY$(0)
660     IF g$="D" OR g$="d" display%=N
OT display%
670     IF turn%=max_turn% game_over%=
TRUE
680    UNTIL game_over% OR foul%>-1
690    IF foul%>-1 THEN
700     COLOUR 1
710     PRINTTAB(0,18)CHR$7"Foul by "p
roc$(who%(foul%))SPC10
720     games(3-foul%)+=1
730     wait=INKEY(200)
740     PRINTTAB(0,18)SPC30
750    ELSE
760     FOR player%=1 TO 2
770      games(player%)+=(1+SGN(FNcoun
t(player%)-FNcount(3-player%)))/2
780     NEXT
790    ENDIF
800    PROCgames_won
810    SWAP first%,last%
820   NEXT
830   FOR player%=1 TO 2
840    score(who%(player%))+=games(pla
yer%)
850   NEXT
860   PROChigh_score
870  NEXT
880 NEXT
890 END
900 :
910 DEF FNcount(player%)
920 LOCAL c%,i%
930 FOR i%=0 TO size%*size%-1
940  IF board%?i%=player% c%+=1
950 NEXT
960 =c%
970 :
980 DEF PROClife
990 LOCAL x%,y%,i%,k%
1000 FOR x%=0 TO size%-1
1010  FOR y%=0 TO size%-1
1020   k%=x%+size%*y%
1030   new%?k%=board%?k%
1040   c%(1)=0
1050   c%(2)=0
1060   FOR xx%=-1 TO 1
1070    FOR yy%=-1 TO 1
1080     c%(FNcell(x%+xx%,y%+yy%))+=1
1090    NEXT
1100   NEXT
1110   c%(FNcell(x%,y%))-=1
1120   IF board%?k%=0 THEN
1130    IF c%(1)+c%(2)=3 THEN
1140     IF c%(1)>c%(2) THEN new%?k%=1
ELSE new%?k%=2
1150    ENDIF
1160   ELSE
1170    IF c%(1)+c%(2)<2 OR c%(1)+c%(2)
>3 THEN new%?k%=0
1180   ENDIF
1190  NEXT
1200 NEXT
1210 FOR i%=0 TO size%*size%-1
1220  board%?i%=new%?i%
1230 NEXT
1240 PROCshow_board
1250 ENDPROC
1260 :
1270 DEF FNcell(x%,y%)
1280 =board%?((x%+size%) MOD size%+size
%*((y%+size%) MOD size%))
1290 :
1300 DEF PROCshow_board
1310 LOCAL i%
1320 IF NOT display% ENDPROC
1330 FOR i%=0 TO size%*size%-1
1340  PROCshow_square(i%)
1350 NEXT
1360 ENDPROC
1370 :
1380 DEF PROCshow_square(i%)
1390 LOCAL x%,y%
1400 x%=i% MOD size%
1410 y%=i% DIV size%
1420 GCOL 7
1430 RECTANGLE x%*64,y%*64,64,64
1440 GCOL board%?i%
1450 CIRCLE FILL x%*64+32,y%*64+32,24
1460 ENDPROC
1470 :
1480 DEF PROCcentre(t$,y%,c%)
1490 COLOUR c%
1500 PRINTTAB(20-LENt$/2,y%)t$
1510 ENDPROC
1520 :
1530 DEF PROCgames_won
1540 COLOUR 3
1550 PRINTTAB(0,5)"Games"
1560 COLOUR 2
1570 FOR player%=1 TO 2
1580  PRINTTAB(0,6+player%);player$(who
%(player%));": ";games(player%);SPC5
1590 NEXT
1600 PRINTTAB(0,10)"Played : ";game%-1;
" "
1610 PRINTTAB(0,11)"To play: ";to_play%
-(game%-1);" "
1620 ENDPROC
1630 :
1640 DEF PROChigh_score
1650 LOCAL i%,j%,hi,best
1660 COLOUR 3
1670 PRINTTAB(20,5)"Top scores"
1680 COLOUR 2
1690 seen%()=FALSE
1700 FOR i%=1 TO players%
1710  hi=-1
1720  FOR j%=0 TO players%-1
1730   IF NOT seen%(j%) AND score(j%)>h
```

```
i hi=score(j%):best=j%
 1740  NEXT
 1750  seen%(best)=TRUE
 1760  PRINTTAB(20,6+i%);player$(best);"
: ";score(best);"   ";
 1770 NEXT
 1780 ENDPROC
 1790 :
 1800 DEF PROCturn(player%,turn%)
 1810 LOCAL time%
 1820 IF foul%>-1 ENDPROC
 1830 time%=TIME
 1840 where%=EVAL("FN"+proc$(who%(player
%))+"(board%,player%,turn%,size%,first%,
time_left%(player%))")
 1850 time_left%(player%)-=(TIME-time%)
 1860 IF time_left%(player%)<0 foul%=pla
yer%
 1870 IF where%<0 OR where%>size%*size%-
1 foul%=player% ELSE IF board%?where%<>0
 foul%=player%
 1880 IF foul%=-1 THEN board%?where%=pla
yer%:IF display% PROCshow_square(where%)
 1890 ENDPROC
 1900 :
 1910 DEF FNlc(a$)
 1920 LOCAL i%
 1930 $str%=a$
 1940 FOR i%=0 TO LEN(a$)-1
 1950  IF str%?i%>=ASC"A" AND str%?i%<=A
SC"Z" THEN str%?i%=str%?i%+32
 1960 NEXT
 1970 =$str%
```

Listing Info17

```
   10 REM     >Stupid (Info17)
   20 REM By  Dave Acton
   30 REM For 32-bit machines
   40 REM (c) BAU June 1993
   50 :
   60 DEF FNstupid(board%,player%,turn%,
size%,first%,left%)
   70 IF turn%=-1 THEN =0
   80 LOCAL best%
   90 REPEAT
  100  best%=RND(size%*size%)-1
  110 UNTIL board%?best%=0
  120 =best%
```

Listing Info18

```
   10 REM     >Simple (Info18)
   20 REM By  Dave Acton
   30 REM For 32-bit machines
   40 REM (c) BAU June 1993
   50 :
   60 DEF FNsimple(board%,player%,turn%,
size%,first%,left%)
   70 LOCAL best_score%,c%(),x%,y%,k%(),
xx%,yy%,brd%()
   80 IF turn%=-1 THEN =0
   90 DIM c%(2),k%(size%+1,size%+1),brd%
(size%+1,size%+1)
  100 FOR x%=0 TO size%+1
  110  FOR y%=0 TO size%+1
  120   brd%(x%,y%)=board%?((x%+size%-1)
 MOD size%+size%*((y%+size%-1) MOD size%
))
  130  NEXT
  140 NEXT
  150 k%()=0
  160 FOR x%=1 TO size%
  170  FOR y%=1 TO size%
  180   IF brd%(x%,y%)=0 THEN
  190    c%()=0
  200    FOR xx%=-1 TO 1
  210     FOR yy%=-1 TO 1
  220      c%(brd%(x%+xx%,y%+yy%))+=1
  230     NEXT
  240    NEXT
  250    c%(brd%(x%,y%))-=1
  260    IF (c%(1)=1 AND c%(2)=1) OR (c%
(player%)=2 AND c%(3-player%)=0) THEN
  270     FOR xx%=-1 TO 1
  280      FOR yy%=-1 TO 1
  290       k%(x%+xx%,y%+yy%)+=1
  300      NEXT
  310     NEXT
  320     k%(x%,y%)-=1
  330    ENDIF
  340   ELSE
  350    k%(x%,y%)=-1000
  360   ENDIF
  370  NEXT
  380 NEXT
  390 best_score%=-1
  400 FOR x%=1 TO size%
  410  FOR y%=1 TO size%
  420   IF brd%(x%,y%)=0 AND k%(x%,y%)>b
est_score% best_score%=k%(x%,y%)
  430  NEXT
  440 NEXT
  450 REPEAT
  460  x%=RND(size%)
  470  y%=RND(size%)
  480 UNTIL k%(x%,y%)=best_score%
  490 =(x%-1)+size%*(y%-1)
```

Listing Info19

```
   10 REM     >Best (Info19)
   20 REM By  Dave Acton
   30 REM For 32-bit machines
   40 REM (c) BAU June 1993
   50 :
   60 DEF FNbest(board%,player%,turn%,si
ze%,first%,left%)
   70 LOCAL best_score%,c%(),t%(),x%,y%,
xx%,yy%,b%(),try_x%,try_y%
   80 IF turn%=-1 DIM best_brd%(size%+1,
size%+1),best_brd2%(size%+1,size%+1):=0
   90 DIM c%(2),t%(2),b%(size%,size%)
  100 FOR x%=0 TO size%+1
  110  FOR y%=0 TO size%+1
  120   best_brd%(x%,y%)=board%?((x%+siz
e%-1) MOD size%+size%*((y%+size%-1) MOD
size%))
  130  NEXT
  140 NEXT
  150 best_score%=-9999
  160 b%()=-10000
  170 FOR try_x%=1 TO size%
  180  FOR try_y%=1 TO size%
  190   IF best_brd%(try_x%,try_y%)=0 TH
EN
  200    best_brd2%()=best_brd%()
  210    t%()=0
  220    best_brd2%(try_x%,try_y%)=playe
r%
  230    FOR x%=1 TO size%
  240     FOR y%=1 TO size%
  250      c%()=0
  260      FOR xx%=-1 TO 1
  270       FOR yy%=-1 TO 1
  280        c%(best_brd2%(x%+xx%,y%+yy%
))+=1
  290       NEXT
  300      NEXT
  310      c%(best_brd2%(x%,y%))-=1
  320      IF best_brd2%(x%,y%)=0 THEN
  330       IF c%(1)+c%(2)=3 THEN
  340        IF c%(1)>c%(2) THEN t%(1)+=
1 ELSE t%(2)+=1
  350       ENDIF
  360      ELSE
  370       IF c%(1)+c%(2)=2 OR c%(1)+c%
(2)=3 THEN t%(best_brd2%(x%,y%))+=1
  380      ENDIF
  390     NEXT
  400    NEXT
  410    b%(try_x%,try_y%)=t%(player%)-t
%(3-player%)
  420    IF b%(try_x%,try_y%)>best_score
% best_score%=b%(try_x%,try_y%)
  430   ENDIF
  440  NEXT
  450 NEXT
  460 REPEAT
  470  x%=RND(size%)
  480  y%=RND(size%)
  490 UNTIL b%(x%,y%)=best_score%
  500 =(x%-1)+size%*(y%-1)
```

Listing Info20

```
   10 REM     >Lives8 (Info20)
   20 REM     Life for two challenge
   30 REM By  Dave Acton
   40 REM For 8-bit machines
   50 REM (c) BAU June 1993
   60 :
   70 mode%=5
   80 IF mode%=5 THEN xs%=128:xw%=10 ELS
E xs%=64:xw%=20
   90 MODE mode%
  100 VDU 23;8202;0;0;0;19,2,2,0,0,0
  110 VDU 23,224,0,3,15,31,31,63,63,63
  120 VDU 23,225,0,224,248,252,252,254,2
54,254
  130 VDU 23,226,63,63,31,31,15,3,0,0
  140 VDU 23,227,254,254,252,252,248,224
,0,0
  150 piece$=CHR$224+CHR$225+CHR$8+CHR$8
+CHR$10+CHR$226+CHR$227
  160 size%=5
  170 max_turn%=100
  180 time_limit%=3*18000
  190 DIM proc$(2),file$(2),player$(2)
  200 player$(1)="Best"
  210 player$(2)="Simple"
  220 proc$(1)="best"
  230 proc$(2)="simple"
  240 DIM c%(2),board% size%*size%,new%
size%*size%,games(2),time_left%(2)
  250 to_play%=10
  260 FOR i%=1 TO 2
  270  dummy%=EVAL("FN"+proc$(i%)+"(0,0,
-1,size%,0,0)")
  280 NEXT
  290 first%=1
  300 last%=2
  310 PROCcentre("Life for two",0,7)
  320 FOR x%=0 TO size%
  330  MOVE x%*xs%,0
  340  DRAW x%*xs%,64*size%
  350  MOVE 0,x%*64
  360  DRAW xs%*size%,x%*64
  370 NEXT
  380 FOR game%=1 TO to_play%
  390  PROCcentre(proc$(1)+" vs "+proc$(
2),2,6)
  400  PROCgames_won
  410  FOR i%=0 TO size%*size%-1
  420   board%?i%=0
  430  NEXT
  440  PROCshow_board
  450  turn%=1
  460  game_over%=FALSE
  470  foul%=-1
  480  time_left%(1)=time_limit%
  490  time_left%(2)=time_limit%
  500  REPEAT
  510   IF turn%>3 PROClife
  520   IF (FNcount(1)>0 AND FNcount(2)>
0) OR turn%<4 THEN PROCplay ELSE game_ov
er%=TRUE
  530   PROCshow_board
  540   IF turn%=max_turn% game_over%=TR
UE
  550  UNTIL game_over% OR foul%>-1
  560  IF foul%>-1 THEN PROCfoul ELSE PR
OCtally
  570  PROCgames_won
  580  temp%=first%
  590  first%=last%
  600  last%=temp%
  610 NEXT
  620 END
  630 :
  640 DEF PROCfoul
  650 COLOUR 1
  660 PRINTTAB(0,18)CHR$7"Foul by "proc$
(foul%)SPC10
  670 games(3-foul%)=games(3-foul%)+1
  680 wait=INKEY(200)
  690 PRINTTAB(0,18)SPC30
  700 ENDPROC
  710 :
  720 DEF PROCtally
  730 FOR player%=1 TO 2
  740  games(player%)=games(player%)+(1+
SGN(FNcount(player%)-FNcount(3-player%))
)/2
  750 NEXT
  760 ENDPROC
  770 :
  780 DEF PROCplay
  790 FOR player%=first% TO last% STEP S
GN(last%-first%)
  800  PROCturn(player%,turn%)
  810 NEXT
  820 turn%=turn%+1
  830 ENDPROC
  840 :
  850 DEF FNcount(player%)
  860 LOCAL c%,i%
  870 FOR i%=0 TO size%*size%-1
  880  IF board%?i%=player% c%=c%+1
  890 NEXT
  900 =c%
  910 :
  920 DEF PROClife
  930 LOCAL x%,y%,i%,k%,cc%
  940 FOR x%=0 TO size%-1
  950  FOR y%=0 TO size%-1
  960   k%=x%+size%*y%
  970   new%?k%=board%?k%
  980   c%(1)=0
  990   c%(2)=0
 1000   FOR xx%=-1 TO 1
 1010    FOR yy%=-1 TO 1
 1020     cc%=FNcell(x%+xx%,y%+yy%)
 1030     c%(cc%)=c%(cc%)+1
 1040    NEXT
 1050   NEXT
 1060   cc%=FNcell(x%,y%)
 1070   c%(cc%)=c%(cc%)-1
 1080   IF board%?k%=0 AND c%(1)+c%(2)=3
 THEN PROCnew_cell
 1090   IF c%(1)+c%(2)<2 OR c%(1)+c%(2)>
3 THEN new%?k%=0
 1100  NEXT
 1110 NEXT
 1120 FOR i%=0 TO size%*size%-1
 1130  board%?i%=new%?i%
 1140 NEXT
 1150 PROCshow_board
 1160 ENDPROC
 1170 :
 1180 DEF PROCnew_cell
 1190 IF c%(1)>c%(2) THEN new%?k%=1 ELSE
 new%?k%=2
 1200 ENDPROC
 1210 :
 1220 DEF FNcell(x%,y%)
 1230 =board%?((x%+size%) MOD size%+size
%*((y%+size%) MOD size%))
 1240 :
 1250 DEF PROCshow_board
 1260 LOCAL i%
 1270 FOR i%=0 TO size%*size%-1
 1280  PROCshow_square(i%)
 1290 NEXT
 1300 ENDPROC
 1310 :
 1320 DEF PROCshow_square(i%)
 1330 LOCAL x%,y%
 1340 x%=i% MOD size%
 1350 y%=i% DIV size%
 1360 VDU 5
 1370 GCOL 0,board%?i%
 1380 MOVE x%*xs%,y%*64+60
 1390 PRINT piece$
 1400 VDU 4
 1410 ENDPROC
 1420 :
 1430 DEF PROCcentre(t$,y%,c%)
 1440 COLOUR c%
 1450 PRINTTAB(xw%-LENt$/2,y%)t$
 1460 ENDPROC
 1470 :
 1480 DEF PROCgames_won
 1490 COLOUR 3
 1500 PRINTTAB(0,5)"Games"
 1510 COLOUR 2
 1520 FOR player%=1 TO 2
 1530  PRINTTAB(0,6+player%);player$(pla
yer%);": ";games(player%);SPC5
 1540 NEXT
 1550 PRINTTAB(0,10)"Played : ";game%-1;
" "
 1560 PRINTTAB(0,11)"To play: ";to_play%
-(game%-1);" "
 1570 ENDPROC
 1580 :
 1590 DEF PROCturn(player%,turn%)
 1600 LOCAL time%
 1610 IF foul%>-1 ENDPROC
 1620 time%=TIME
 1630 where%=EVAL("FN"+proc$(player%)+"(
board%,player%,turn%,size%,first%,time_l
eft%(player%))")
 1640 time_left%(player%)=time_left%(pla
yer%)-(TIME-time%)
 1650 IF time_left%(player%)<0 foul%=pla
yer%
 1660 IF where%<0 OR where%>size%*size%-
1 foul%=player% ELSE IF board%?where%<>0
 foul%=player%
 1670 IF foul%=-1 THEN board%?where%=pla
yer%:PROCshow_square(where%)
 1680 ENDPROC
 1690 :
 1700 REM >Procs.Best8
 1710 :
 1720 DEF FNbest(board%,player%,turn%,si
ze%,first%,left%)
 1730 LOCAL best_score%,x%,y%,try_x%,try
_y%
 1740 IF turn%=-1 DIM best_brd%(size%+1,
size%+1),best_brd2%(size%+1,size%+1),bes
t_c%(2),best_t%(2),best_b%(size%,size%):
=0
 1750 FOR x%=0 TO size%+1
 1760  FOR y%=0 TO size%+1
 1770   best_brd%(x%,y%)=board%?((x%+siz
e%-1) MOD size%+size%*((y%+size%-1) MOD
size%))
 1780  NEXT
 1790 NEXT
 1800 best_score%=-9999
 1810 FOR x%=1 TO size%
 1820  FOR y%=1 TO size%
 1830   best_b%(x%,y%)=-10000
 1840  NEXT
 1850 NEXT
 1860 FOR try_x%=1 TO size%
 1870  FOR try_y%=1 TO size%
 1880   IF best_brd%(try_x%,try_y%)=0 PR
OCbest_try(try_x%,try_y%)
 1890  NEXT
 1900 NEXT
 1910 REPEAT
 1920  x%=RND(size%)
 1930  y%=RND(size%)
 1940 UNTIL best_b%(x%,y%)=best_score%
 1950 =(x%-1)+size%*(y%-1)
 1960 :
 1970 DEF PROCbest_try(try_x%,try_y%)
 1980 LOCAL x%,y%,xx%,yy%,cc%
 1990 FOR x%=0 TO size%+1
 2000  FOR y%=0 TO size%+1
 2010   best_brd2%(x%,y%)=best_brd%(x%,y
%)
 2020  NEXT
 2030 NEXT
 2040 best_t%(1)=0
 2050 best_t%(2)=0
 2060 best_brd2%(try_x%,try_y%)=player%
 2070 FOR x%=1 TO size%
 2080  FOR y%=1 TO size%
 2090   best_c%(1)=0
 2100   best_c%(2)=0
 2110   FOR xx%=-1 TO 1
 2120    FOR yy%=-1 TO 1
 2130     cc%=best_brd2%(x%+xx%,y%+yy%)
 2140     best_c%(cc%)=best_c%(cc%)+1
 2150    NEXT
 2160   NEXT
 2170   cc%=best_brd2%(x%,y%)
 2180   best_c%(cc%)=best_c%(cc%)-1
 2190   IF best_brd2%(x%,y%)=0 AND best_
c%(1)+best_c%(2)=3 PROCbest_newcell
 2200   IF best_brd2%(x%,y%)<>0 AND (bes
t_c%(1)+best_c%(2)=2 OR best_c%(1)+best_
c%(2)=3) THEN cc%=best_brd2%(x%,y%):best
_t%(cc%)=best_t%(cc%)+1
 2210  NEXT
 2220 NEXT
 2230 best_b%(try_x%,try_y%)=best_t%(pla
yer%)-best_t%(3-player%)
 2240 IF best_b%(try_x%,try_y%)>best_sco
re% best_score%=best_b%(try_x%,try_y%)
 2250 ENDPROC
 2260 :
 2270 DEF PROCbest_newcell
 2280 IF best_c%(1)>best_c%(2) THEN best
_t%(1)=best_t%(1)+1 ELSE best_t%(2)=best
_t%(2)+1
 2290 ENDPROC
 2300 :
 2310 REM >Procs.Simple8
 2320 :
 2330 DEF FNsimple(board%,player%,turn%,
size%,first%,left%)
 2340 LOCAL best_score%,x%,y%
 2350 IF turn%=-1 DIM simple_c%(2),simpl
e_k%(size%+1,size%+1),simple_brd%(size%+
1,size%+1):=0
 2360 FOR x%=0 TO size%+1
 2370  FOR y%=0 TO size%+1
 2380   simple_brd%(x%,y%)=board%?((x%+s
ize%-1) MOD size%+size%*((y%+size%-1) MO
D size%))
 2390  NEXT
 2400 NEXT
 2410 FOR x%=0 TO size%+1
 2420  FOR y%=0 TO size%+1
 2430   simple_k%(x%,y%)=0
 2440  NEXT
 2450 NEXT
 2460 FOR x%=1 TO size%
 2470  FOR y%=1 TO size%
 2480   IF simple_brd%(x%,y%)=0 PROCsimp
le_try(x%,y%) ELSE simple_k%(x%,y%)=-100
0
 2490  NEXT
 2500 NEXT
 2510 best_score%=-1
 2520 FOR x%=1 TO size%
 2530  FOR y%=1 TO size%
 2540   IF simple_brd%(x%,y%)=0 AND simp
le_k%(x%,y%)>best_score% best_score%=sim
ple_k%(x%,y%)
 2550  NEXT
 2560 NEXT
 2570 REPEAT
 2580  x%=RND(size%)
 2590  y%=RND(size%)
 2600 UNTIL simple_k%(x%,y%)=best_score%
 2610 =(x%-1)+size%*(y%-1)
 2620 :
 2630 DEF PROCsimple_try(x%,y%)
 2640 LOCAL xx%,yy%,cc%
```

```
2650 simple_c%(1)=0
2660 simple_c%(2)=0
2670 FOR xx%=-1 TO 1
2680  FOR yy%=-1 TO 1
2690   cc%=simple_brd%(x%+xx%,y%+yy%)
2700   simple_c%(cc%)=simple_c%(cc%)+1
2710  NEXT
2720 NEXT
2730 cc%=simple_brd%(x%,y%)
2740 simple_c%(cc%)=simple_c%(cc%)-1
2750 IF NOT ((simple_c%(1)=1 AND simple
_c%(2)=1) OR (simple_c%(player%)=2 AND s
imple_c%(3-player%)=0)) ENDPROC
2760 FOR xx%=-1 TO 1
2770  FOR yy%=-1 TO 1
2780   simple_k%(x%+xx%,y%+yy%)=simple_
k%(x%+xx%,y%+yy%)+1
2790  NEXT
2800 NEXT
2810 simple_k%(x%,y%)=simple_k%(x%,y%)-
1
2820 ENDPROC
```

3D GRAPHICS (page 90)

Listing 3DGraphics1

```
   10 REM     >3Dprocs
   20 REM By  Dave Acton
   30 REM For 32-bit machines
   40 REM (c) BAU June 1993
   50 :
   60 DEF PROCinit3D
   70 max=100
   80 DIM key$(max),obj(max),dat &1000,o
(2),a(2)
   90 key$()="rem","include","colour","s
urface","object","merge"
  100 keywords=6
  110 keydef=keywords
  120 p=dat
  130 max_tri=1000
  140 DIM plot_list 32*max_tri
  150 DIM plot_p 4*max_tri
  160 dist=800
  170 zplus=200000
  180 ENDPROC
  190 :
  200 DEF PROCrotate(x,y,z,a,b,c,RETURN
x2,RETURN y2,RETURN z2)
  210 x2=x*COSRAD(b/ang_scale)+z*SINRAD(
b/ang_scale)
  220 y2=y
  230 z2=-x*SINRAD(b/ang_scale)+z*COSRAD
(b/ang_scale)
  240 ENDPROC
  250 :
  260 DEF PROCload(f$)
  270 LOCAL in,line,k,i,cur_obj$
  280 PRINT"Loading '"f$"'..."
  290 in=OPENIN(f$)
  300 line=1
  310 cur_obj$=""
  320 cur_mode=-1
  330 scale=10000:REM Units in 1/10mm
  340 ang_scale=&10000/360:REM angles fr
om 0 to &FFFF
  350 WHILE NOT EOF#in
  360  s$=FNstrip(GET$#in)
  370  IF ASC(s$)>=48 AND ASC(s$)<=57 TH
EN
  380   IF cur_mode<>3 THEN
  390    PROCerror("Co-ordinates not exp
ected")
  400   ELSE
  410    FOR i=0 TO 2
  420     PROCget_par(s$,p$)
  430     !p=VAL(p$)*scale
  440     p+=4
  450    NEXT
  460    surfp!4+=1
  470   ENDIF
  480  ELSE
  490   PROCget_par(s$,p$)
  500   IF p$<>"" THEN
  510    IF RIGHT$(p$,1)=":" THEN
  520     k=FNidentify_keyword(LEFT$(p$)
)
  530     IF k=-1 THEN
  540      PROCerror("Unknown keyword '"
+p$+"'")
  550     ELSE
  560      IF k<keywords cur_mode=k
  570      CASE k OF
  580       WHEN 0:REM rem:
  590       WHEN 1:REM include:
  600        PROCload(FNfirst_bit(f$)+".
"+FNstrip(s$))
  610       WHEN 2:REM colour:
  620        cur_col=0
  630        FOR i=1 TO 3
  640         PROCget_par(s$,p$)
  650         cur_col+=VAL(p$)<<(8*i)
  660        NEXT
  670       WHEN 3:REM surface:
  680        surfp=p
  690        !p=0
  700        p!4=0
  710        p!8=cur_col
  720        p+=12
  730       WHEN 4:REM object
  740        !p=-1
  750        p+=4
  760        cur_obj$=FNstrip(s$)
  770        IF FNidentify_keyword(cur_o
bj$)<>-1 THEN
  780         PROCerror("'"+cur_obj$+"'
defined twice")
  790        ELSE
  800         key$(keydef)=cur_obj$
  810         obj(keydef)=p
  820         keydef+=1
  830        ENDIF
  840        cur_col=&FFFFFF
  850      OTHERWISE
  860       FOR i=0 TO 2
  870        PROCget_par(s$,p$)
  880        o(i)=VAL(p$)*scale
  890       NEXT
  900       FOR i=0 TO 2
  910        PROCget_par(s$,p$)
  920        a(i)=VAL(p$)*ang_scale
  930       NEXT
  940       merge=FALSE
  950       WHILE s$<>""
  960        PROCget_par(s$,p$)
  970        CASE FNidentify_keyword(p$)
 OF
  980         WHEN 5:merge=TRUE
  990        ENDCASE
 1000       ENDWHILE
 1010       IF merge THEN
 1020        PROCmerge(obj(k),o(),a())
 1030       ELSE
 1040        !p=k
 1050        FOR i=0 TO 2
 1060         !(p+4+4*i)=o(i)
 1070         !(p+16+4*i)=a(i)
 1080        NEXT
 1090        p+=28
 1100       ENDIF
 1110      ENDCASE
 1120     ENDIF
 1130    ENDIF
 1140   ENDIF
 1150  ENDIF
 1160  line+=1
 1170 ENDWHILE
 1180 !p=-1
 1190 p+=4
 1200 CLOSE#in
 1210 ENDPROC
 1220 :
 1230 DEF PROCmerge(a,o(),a())
 1240 LOCAL do(),da(),i,bytes
 1250 DIM do(2),da(2)
 1260 WHILE !a<>-1
 1270  IF !a=0 OR !a=1 THEN
 1280   !p=1
 1290   n=a!4
 1300   p!4=n
 1310   p!8=a!8
 1320   p+=12
 1330   a+=12
 1340   FOR i=1 TO n
 1350    PROCrotate(!a,a!4,a!8,a(0),a(1)
,a(2),do(0),do(1),do(2))
 1360    p!0=o(0)+do(0)
 1370    p!4=o(1)+do(1)
 1380    p!8=o(2)+do(2)
 1390    p+=12
 1400    a+=12
 1410   NEXT
 1420  ELSE
 1430   PROCrotate(a!4,a!8,a!12,a(0),a(1
),a(2),do(0),do(1),do(2))
 1440   da(0)=a!16+a(0)
 1450   da(1)=a!20+a(1)
 1460   da(2)=a!24+a(2)
 1470   do(0)+=o(0)
 1480   do(1)+=o(1)
 1490   do(2)+=o(2)
 1500   PROCmerge(obj(!a),do(),da())
 1510   a+=28
 1520  ENDIF
 1530 ENDWHILE
 1540 ENDPROC
 1550 :
 1560 DEF PROCerror(err$)
 1570 PRINT err$" at line ";line;" of '"
f$"'"
 1580 ENDPROC
 1590 :
 1600 DEF FNfirst_bit(f$)
 1610 LOCAL i
 1620 i=LEN(f$)+1
 1630 REPEAT
 1640  i-=1
 1650 UNTIL i=1 OR MID$(f$,i,1)="."
 1660 =LEFT$(f$,i-1)
 1670 :
 1680 DEF FNidentify_keyword(k$)
 1690 LOCAL i
 1700 i=-1
 1710 REPEAT
 1720  i+=1
 1730 UNTIL i=max OR key$(i)=k$
 1740 IF i=max THEN i=-1
 1750 =i
 1760 :
 1770 DEF PROCget_par(RETURN s$,RETURN p
$)
 1780 LOCAL i,c$
 1790 s$=FNstrip(s$)
 1800 IF s$="" THEN
 1810  p$=""
 1820 ELSE
 1830  i=0
 1840  REPEAT
 1850   i+=1
 1860   c$=MID$(s$,i,1)
 1870  UNTIL c$="" OR c$="," OR c$=" "
 1880  p$=FNstrip(LEFT$(s$,i-1))
 1890  s$=MID$(s$,i+1)
 1900 ENDIF
 1910 ENDPROC
 1920 :
 1930 DEF FNlc(s$)
 1940 LOCAL i,c
 1950 FOR i=1 TO LEN(s$)
 1960  c=ASCMID$(s$,i)
 1970  IF c>=65 AND c<=90 MID$(s$,i)=CHR
$(c+32)
 1980 NEXT
 1990 =s$
 2000 :
 2010 DEF FNstrip(s$)
 2020 WHILE LEFT$(s$,1)=" "
 2030  s$=MID$(s$,2)
 2040 ENDWHILE
 2050 WHILE RIGHT$(s$)=" "
 2060  s$=LEFT$(s$)
 2070 ENDWHILE
 2080 =s$
 2090 :
 2100 DEF PROCregister_triangle(a,tri(),
ox,oy,oz,alpha,beta,gamma,new_face)
 2110 LOCAL x,y,z,x2,y2,z2,i,aa
 2120 IF new_face THEN
 2130  cur_face=plot_ptr
 2140  cur_totalz=0
 2150  cur_zno=0
 2160  cur_face!4=0
 2170  plot_ptr+=8
 2180  plot_p!(4*faces)=cur_face
 2190  faces+=1
 2200 ENDIF
 2210 SYS "ColourTrans_ReturnGCOL",a!8 T
O !plot_ptr
 2220 plot_ptr+=4
 2230 FOR i=0 TO 2
 2240  aa=a+12+12*tri(i)
 2250  x=!aa
 2260  y=aa!4
 2270  z=aa!8
 2280  PROCrotate(x,y,z,alpha,beta,gamma
,x2,y2,z2)
 2290  x2+=ox
 2300  y2+=oy
 2310  z2+=oz
 2320  cur_totalz+=z2
 2330  cur_zno+=1
 2340  !plot_ptr=dist*x2/(z2+zplus)
 2350  plot_ptr!4=dist*y2/(z2+zplus)
 2360  plot_ptr+=8
 2370 NEXT
 2380 cur_face!4+=1
 2390 !cur_face=cur_totalz/cur_zno
 2400 triangles+=1
 2410 ENDPROC
 2420 :
 2430 DEF PROCinit_record
 2440 max_frames=50
 2450 DIM frame_store 250*1024,frame_ptr
(max_frames)
 2460 frames=0
 2470 fptr=frame_store
 2480 ENDPROC
 2490 :
 2500 DEF PROCrecord_display
 2510 SYS "OS_HeapSort",faces,plot_p,3
 2520 frame_ptr(frames)=fptr
 2530 FOR i=faces-1 TO 0 STEP -1
 2540  a=plot_p!(4*i)
 2550  n=a!4
 2560  a+=8
 2570  FOR j=0 TO 28*n-1 STEP 4
 2580   fptr!j=a!j
 2590  NEXT
 2600  fptr+=28*n
 2610 NEXT
 2620 !fptr=-1
 2630 fptr+=4
 2640 frames+=1
 2650 ENDPROC
 2660 :
 2670 DEF PROCplay_back
 2680 bank=1
 2690 FOR frame=0 TO frames-1
 2700  WAIT
 2710  SYS 6,112,bank
 2720  bank=3-bank
 2730  SYS 6,113,bank
 2740  SYS "ColourTrans_SetGCOL",&1FB347
00
 2750  RECTANGLE FILL -640,-512,1280,512
 2760  SYS "ColourTrans_SetGCOL",&FFFFCA
00
 2770  RECTANGLE FILL -640,0,1280,512
 2780  a=frame_ptr(frame)
 2790  WHILE !a<>-1
 2800   GCOL (!a)>>2 TINT (!a AND 3)<<6
 2810   MOVE a!4,a!8
 2820   MOVE a!12,a!16
 2830   PLOT 85,a!20,a!24
 2840   a+=28
 2850  ENDWHILE
 2860 NEXT
 2870 ENDPROC
```

Listing 3DGraphics2

```
   10 REM     >3Ddemo1
   20 REM By  Dave Acton
   30 REM For 32-bit machines
   40 REM (c) BAU June 1993
   50 :
   60 LIBRARY "3Dprocs"
   70 MODE 13
   80 OFF
   90 PROCinit3D
  100 PROCload("objects.world1")
  110 ORIGIN 640,512
  120 PROCinit_record
  130 FOR view=0 TO 359 STEP 10
  140  PRINTCHR$13"Frame: ";frames;
  150  PROCrender("world",0,-60000*(1+CO
SRAD(view)),300000,view*ang_scale)
  160  PROCrecord_display
  170 NEXT
  180 REPEAT
  190  PROCplay_back
  200 UNTIL FALSE
  210 END
  220 :
  230 DEF PROCrender(obj$,ox,oy,oz,beta)
  240 LOCAL a
  250 a=obj(FNidentify_keyword(obj$))
  260 plot_ptr=plot_list
  270 triangles=0
  280 faces=0
  290 PROCrender_obj(a,ox,oy,oz,0,beta,0
)
  300 ENDPROC
  310 :
  320 DEF PROCrender_obj(a,ox,oy,oz,alph
a,beta,gamma)
  330 LOCAL n,x2,y2,z2,tri(),new
  340 DIM tri(2)
  350 WHILE !a<>-1
  360  IF !a=0 OR !a=1 THEN
  370   new=(!a=0)
  380   n=a!4
  390   tri(0)=0
  400   FOR i=1 TO n-2
  410    tri(1)=i
  420    tri(2)=i+1
  430    PROCregister_triangle(a,tri(),o
x,oy,oz,alpha,beta,gamma,i=1 AND new)
  440   NEXT
  450   a+=12*(n+1)
  460  ELSE
  470   PROCrotate(a!4,a!8,a!12,alpha,be
ta,gamma,x2,y2,z2)
  480   PROCrender_obj(obj(!a),ox+x2,oy+
y2,oz+z2,alpha+a!16,beta+a!20,gamma+a!24
)
  490   a+=28
  500  ENDIF
  510 ENDWHILE
  520 ENDPROC
```

Listing 3DGraphics3

```
   10 REM     >3Ddemo2
   20 REM By  Dave Acton
   30 REM For 32-bit machines
   40 REM (c) BAU June 1993
   50 :
   60 LIBRARY "3Dprocs"
   70 MODE 13
   80 OFF
   90 PROCinit3D
  100 PROCload("objects.world1")
  110 PROCfind_flat_objects
  120 ORIGIN 640,512
  130 PROCinit_record
  140 FOR view=0 TO 359 STEP 10
  150  PRINTCHR$13"Frame: ";frames;
  160  PROCrender("world",0,-60000*(1+CO
SRAD(view)),300000,view*ang_scale)
  170  PROCrecord_display
  180 NEXT
  190 REPEAT
  200  PROCplay_back
  210 UNTIL FALSE
  220 END
  230 :
  240 DEF PROCfind_flat_objects
  250 LOCAL obj
  260 DIM is_flat(max)
  270 FOR obj=keywords TO keydef-1
  280  is_flat(obj)=FNis_flat(obj)
  290 NEXT
  300 ENDPROC
  310 :
  320 DEF FNis_flat(obj)
  330 LOCAL a,is_flat,i,n
  340 is_flat=TRUE
  350 a=obj(obj)
  360 WHILE !a<>-1 AND is_flat
  370  IF !a=0 OR !a=1 THEN
  380   n=a!4
  390   FOR i=1 TO n
  400    is_flat=is_flat AND a!(12*i+8)=
0
  410   NEXT
  420   a+=12*(n+1)
  430  ELSE
  440   is_flat=a!16=0 AND a!20=0 AND a!
24=0 AND FNis_flat(!a)
  450   a+=28
  460  ENDIF
  470 ENDWHILE
  480 =is_flat
  490 :
  500 DEF PROCrender(obj$,ox,oy,oz,beta)
  510 plot_ptr=plot_list
  520 triangles=0
  530 faces=0
  540 PROCrender_obj(FNidentify_keyword(
obj$),ox,oy,oz,0,beta,0)
  550 ENDPROC
  560 :
  570 DEF PROCrender_obj(obj,ox,oy,oz,al
pha,beta,gamma)
  580 LOCAL n,x2,y2,z2,tri(),new,a,norm_
x,norm_z
  590 IF is_flat(obj) THEN
  600  norm_x=SINRAD(0+beta/ang_scale)
  610  norm_z=COSRAD(0+beta/ang_scale)
  620  IF (norm_x*ox)+(norm_z*(oz+zplus)
)<0 ENDPROC
  630 ENDIF
  640 DIM tri(2)
  650 a=obj(obj)
```

```
  660 WHILE !a<>-1
  670  IF !a=Ø OR !a=1 THEN
  680   new=(!a=Ø)
  690   n=a!4
  700   tri(Ø)=Ø
  710   FOR i=1 TO n-2
  720    tri(1)=i
  730    tri(2)=i+1
  740    PROCregister_triangle(a,tri(),o
x,oy,oz,alpha,beta,gamma,i=1 AND new)
  750   NEXT
  760   a+=12*(n+1)
  770  ELSE
  780   PROCrotate(a!4,a!8,a!12,alpha,be
ta,gamma,x2,y2,z2)
  790   PROCrender_obj(!a,ox+x2,oy+y2,oz
+z2,alpha+a!16,beta+a!20,gamma+a!24)
  800   a+=28
  810  ENDIF
  820 ENDWHILE
  830 ENDPROC
```

Listing 3DGraphics4

```
rem: >objects.House

object: door

  colour: 255,255,255

  surface:

   0,0,0
   2,0,0
   2,4.5,0
   0,4.5,0

  colour: 0,0,0

  surface:

    0.2,0,0
    1.8,0,0
    1.8,4.3,0
    0.2,4.3,0

object: window

  colour: 255,255,255

  surface:

    0,0,0
    3,0,0
    3,3,0
    0,3,0

  colour: 0,0,0

  surface:

    0.3,0.3,0
    2.7,0.3,0
    2.7,2.7,0
    0.3,2.7,0

object: half_roof

  colour: 117,21,13

  surface:

    0,0,0
    2,3,5
    0,0,10

  surface:

    0,0,0
    2,3,5
    13,3,5
    15,0,0

object: endwall

  colour: 168,136,98

  surface:

    0,0,0
    10,0,0
    10,10,0
    0,10,0

  door: 4,0,0 0,0,0  merge

object: sidewall

  colour: 168,136,98

  surface:

    0,0,0   0,0,0
    15,0,0  0,0,0
    15,10,0 0,0,0
    0,10,0  0,0,0

  window: 1,6,0  0,0,0  merge
  window: 6,6,0  0,0,0  merge
  window: 1,1,0  0,0,0  merge
  window: 11,1,0 0,0,0  merge
  window: 11,6,0 0,0,0  merge
  door:   6.5,0,0  0,0,0  merge

object: house

   sidewall: 0,0,0   0,0,0
   sidewall: 15,0,10 0,180,0
   endwall:  15,0,0  0,270,0
   endwall:  0,0,10  0,90,0

   half_roof: 0,10,0   0,0,0
   half_roof: 15,10,10 0,180,0
```

Listing 3DGraphics5

```
rem: >objects.world1

include: house

object: world

  house: -7.5,0,-5   0,0,0

  house: 10,0,-15  0,45,0

  house: -27,0,-10 0,60,0
```

Listing 3DGraphics6

```
   10 REM     >PerspDemo
   20 REM By  Dave Acton
   30 REM For 32-bit machines
   40 REM (c) BAU June 1993
   50 :
   60 MODE Ø
   70 OFF
   80 ORIGIN 64Ø,512
   90 PROCinit
  100 bank=1
  110 MOUSE TO Ø,Ø
  120 REPEAT
  130  FOR ang=Ø TO 359 STEP 5
  140   WAIT
  150   SYS "OS_Byte",112,bank
  160   bank=3-bank
  170   SYS "OS_Byte",113,bank
  180   CLS
  190   MOUSE mx,my,mb
  200   zoff=3Ø+my/1Ø
  210   IF zoff=Ø zoff=1
  220   d=mx+8ØØ
  230   PRINT"d=";d'"zoff=";zoff
  240   PROCshow(ang)
  250  NEXT
  260 UNTIL FALSE
  270 END
  280 :
  290 DEF PROCinit
  300 DIM vert(7,2)
  310 FOR v=Ø TO 7
  320  vert(v,Ø)=(v AND 1)-Ø.5
  330  vert(v,1)=((v AND 2)>>1)-Ø.5
  340  vert(v,2)=((v AND 4)>>2)-Ø.5
  350 NEXT
  360 ENDPROC
  370 :
  380 DEF PROCshow(ang)
  390 FOR v=Ø TO 3
  400  PROCdraw(v,v+4,ang)
  410  PROCdraw(2*v,2*v+1,ang)
  420 NEXT
  430 PROCdraw(Ø,2,ang)
  440 PROCdraw(1,3,ang)
  450 PROCdraw(4,6,ang)
  460 PROCdraw(5,7,ang)
  470 ENDPROC
  480 :
  490 DEF PROCdraw(vØ,v1,ang)
  500 PROCplot(4,vØ,ang)
  510 PROCplot(5,v1,ang)
  520 ENDPROC
  530 :
  540 DEF PROCplot(code,v,ang)
  550 LOCAL x2,y2,z2
  560 x2=vert(v,Ø)*COSRAD(ang)+vert(v,2)
*SINRAD(ang)
  570 y2=vert(v,1)
  580 z2=-vert(v,Ø)*SINRAD(ang)+vert(v,2
)*COSRAD(ang)
  590 PLOT code,d*x2/(z2+zoff),d*y2/(z2+
zoff)
  600 ENDPROC
```

ASSEMBLY LINE (page 105)

Listing Arm1

```
   10 REM     >Arm1
   20 REM By  Dave Lawrence
   30 REM For 32-bit machines
   40 REM (c) BAU June 1993
   50 :
   60 bits=8
   70 mult=1<<bits
   80 :
   90 DIM code 1ØØØ
  100 link=14:pc=15
  110 FOR pass=Ø TO 2 STEP 2
  120 P%=code
  130 [OPT pass
  140         MUL     RØ,R1,RØ
  150         MOV     RØ,RØ,ASR #bits
  160         MOV     pc,link
  170 ]
  180 NEXT
  190 REPEAT
  200  INPUT "Two numbers: "A,B
  210  A%=A*mult
  220  B%=B*mult
  230  PRINT USR(code)/mult,A*B
  240 UNTIL FALSE
```

Listing Arm2

```
   10 REM     >Arm2
   20 REM     Divide routine
   30 REM By  Dave Lawrence
   40 REM For 32-bit machines
   50 REM (c) BAU June 1993
   60 :
   70 DIM code 1ØØØ
   80 top=Ø
   90 bot=1
  100 result=2
  110 sign=3
  120 bit=4
  130 sp=13
  140 link=14
  150 pc=15
  160 FOR pass=Ø TO 2 STEP 2:P%=code
  170 [OPT pass
  180 .divide
  190         STMFD   (sp)!,{result ,sign
,bit}
  200         MOV     result,#Ø
  210         MOV     bit,#1
  220         EOR     sign,top,bot
  230         CMP     bot,#Ø
  240         RSBMI   bot,bot,#Ø
  250         CMP     top,#Ø
  260         RSBMI   top,top,#Ø
  270         CMP     top,#2^24
  280         BLT     skip1
  290         FNdiv(31)
  300         FNdiv(3Ø)
  310         FNdiv(29)
  320         FNdiv(28)
  330         FNdiv(27)
  340         FNdiv(26)
  350         FNdiv(25)
  360 .skip1
  370         CMP     top,#2^16
  380         BLT     skip2
  390         FNdiv(24)
  400         FNdiv(23)
  410         FNdiv(22)
  420         FNdiv(21)
  430         FNdiv(2Ø)
  440         FNdiv(19)
  450         FNdiv(18)
  460         FNdiv(17)
  470 .skip2
  480         CMP     top,#2^8
  490         BLT     skip3
  500         FNdiv(16)
  510         FNdiv(15)
  520         FNdiv(14)
  530         FNdiv(13)
  540         FNdiv(12)
  550         FNdiv(11)
  560         FNdiv(1Ø)
  570         FNdiv(9)
  580         FNdiv(8)
  590 .skip3
  600         FNdiv(7)
  610         FNdiv(6)
  620         FNdiv(5)
  630         FNdiv(4)
  640         FNdiv(3)
  650         FNdiv(2)
  660         FNdiv(1)
  670         FNdiv(Ø)
  680 .donediv
  690         MOV     top,result
  700         CMP     sign,#Ø
  710         RSBMI   top,top,#Ø
  720         LDMFD   (sp)!,{result ,sign
,bit}
  730
  740         MOV     pc,link
  750 ]NEXT
  760 REPEAT
  770  INPUT "Two numbers "A%,B%
  780  PRINT USR(code),A% DIV B%
  790 UNTIL FALSE
  800 :
  810 DEF FNdiv(it)
  820 IF it>Ø THEN
  830 [OPT pass
  840 CMP     bot,top,LSR #it
  850 ORRLE   result,result,bit,ASL #it
  860 SUBLE   top,top,bot,ASL #it
  870 ]
  880 ELSE
  890 [OPT pass
  900 CMP     bot,top
  910 ORRLE   result,result,#1
  920 SUBLE   top,top,bot
  930 ]
  940 ENDIF
  950 =""
```

Listing Arm3

```
   10 REM     >Arm3
   20 REM     Square root
   30 REM By  Dave Lawrence
   40 REM For 32-bit machines
   50 REM (c) BAU June 1993
   60 :
   70 DIM code 1ØØØ
   80 x=Ø:a=1:c=2:sum=3
   90 link=14:pc=15
  100 FOR pass=Ø TO 2 STEP 2:P%=code
  110 [OPT pass
  120 .sqr
  130         MOV     a,#1
  140         MOV     c,#Ø
  150         B       cmp
  160 .loop
  170         MOV     a,a,ASL #2
  180 .cmp
  190         CMP     a,x
  200         BLT     loop
  210 .loop2
  220         ADD     sum,a,c
  230         MOV     c,c,LSR #1
  240         CMP     x,sum
  250         SUBGE   x,x,sum
  260         ADDGE   c,c,a
  270         MOVS    a,a,LSR #2
  280         BNE     loop2
  290
  300         CMP     c,x
  310         ADDLT   RØ,c,#1
  320         MOVGE   RØ,c
  330
  340         MOV     pc,link
  350 ]NEXT
  360 FOR A%=1 TO 8ØØØ
  370 PRINT A%,USR(sqr),INT(SQR(A%)+.5)
  380 NEXT
```

Listing Arm4

```
   10 REM     >Arm4
   20 REM By Dave Lawrence
   30 REM For 32-bit machines
   40 REM (c) BAU June 1993
   50 :
   60 MODE Ø:OFF
   70 :
   80 sp=13:link=14:pc=15
   90 DIM code 1ØØ
  100 FOR pass=Ø TO 2 STEP 2
  110 P%=code
  120 [OPT pass
  130 .rand
  140         LDR     RØ,Aseed
  150         LDR     R1,Axor
  160         MOVS    RØ,RØ,LSL #1
  170         EORCS   RØ,RØ,R1
  180         STR     RØ,Aseed
  190
  200         MOVCC   RØ,#Ø
  210         MOVCS   RØ,#1
  220
  230         MOV     pc,link
  240
  250 .Aseed  EQUD TIME
  260 .Axor   EQUD &1D872B41
  270 ]
  280 NEXT
  290 REPEAT
  300 FOR y=255 TO Ø STEP -1
  310  FOR x=Ø TO 639
  320   GCOL USR(rand)
  330   POINT x*2,y*4
  340  NEXT
  350 NEXT
  360 UNTILØ
```

Listing Arm5

```
   10 REM     >Arm5
   20 REM By  Dave Lawrence
   30 REM For 32-bit machines
   40 REM (c) BAU June 1993
   50 :
   60 MODE 9:OFF
   70 FOR c=1 TO 15
   80  COLOUR c,RND,RND,RND
   90 NEXT
  100 DIM code 2ØØ
  110 FOR pass=Ø TO 2 STEP 2:P%=code
  120 [OPT pass
  130         LDR     RØ,seed
  140         LDR     R1,c1
  150         LDR     R2,c2
  160         MLA     RØ,R1,RØ,R2
  170         MLA     R3,R1,RØ,R2
  180         STR     R3,seed
  190         EOR     RØ,RØ,R3,ROR #16
  200         MOV     PC,R14
  210
  220 .c1     EQUD    1664525
  230 .c2     EQUD    9Ø7633393
  240 .seed   EQUD    TIME
  250 ]NEXT
  260 REPEAT
  270  rnd=USR(code)
  280  GCOL USR(code) AND 15
  290  POINT (USR(code) AND 255)*4,(USR(
code) AND 255)*4
  300 UNTIL Ø
```

Listing Arm6

```
   10 REM     >Arm6
   20 REM By  Dave Lawrence
   30 REM For 32-bit machines
   40 REM (c) BAU June 1993
   50 :
   60 DIM code 2ØØ
   70 link=14:pc=15
   80 FOR pass=Ø TO 2 STEP 2:P%=code
   90 [OPT pass
  100         MOVS    RØ,#Ø
  110
  120
  130         MOV     RØ,PC,LSR #28
  140         MOV     pc,link
  150
  160 ]NEXT
  170 bits=USR(code)
  180 IF bits AND 8 PRINT"N ";
  190 IF bits AND 4 PRINT"Z ";
  200 IF bits AND 2 PRINT"C ";
  210 IF bits AND 1 PRINT"V ";
  220 IF bits=Ø PRINT"Nothing" ELSE PRIN
T
```

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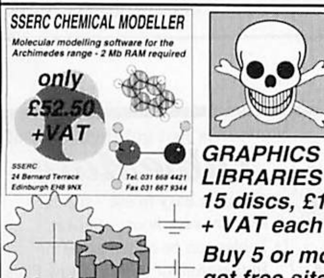


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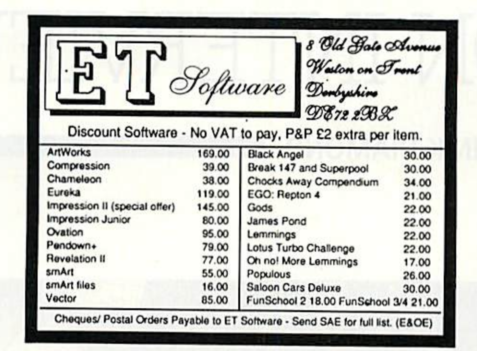
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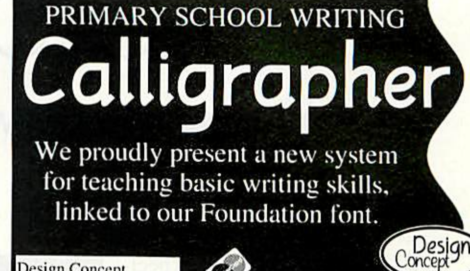
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ACORN USER ADVERTISEMENT PAGES
JUNE 1993

THE MOXON INTERVIEW

DOMINIK DIAMOND

I have to admit, I was expecting something different. Dominik Diamond, presenter of Channel Four's cult *GamesMaster* programme, looks far more human over a pint of lager top than he does on his weekly TV spot.

He's just spent a hectic day hosting the *Acorn User* show in Harrogate and he seems pretty enthusiastic.

'I have to say I'm genuinely impressed by the standard and amount of games available for the Archimedes,' he says.

'Let's face it: the new products for the consoles this year have been absolute rubbish, and the Acorn world has got so much more good stuff coming out. And it's so refreshing to see that there aren't loads of boring licence tie-ins, but plenty of original games around.'



That may be the case but, as most viewers know, *GamesMaster* is not renowned for its coverage of Acorn games.

'Most of the coverage I deal with is concerned with Sega, Nintendo and Commodore, simply because of the volume of the markets. Before today I wasn't aware of the amount of *original* software on the Acorn; the market's just like the Amiga was five years ago. If Acorn can jump five years in one year, they will become really serious competitors.

'Acorn will do so well because its image is good with parents. What it needs now is more and more games – the serious products are already there – and more publicity in multi-format titles.

'The games in the Acorn market are of a very high quality, as only the best conversions have been made; Krisalis, for example, hasn't produced one turkey for the Arc. The *Lotus Turbo Challenge* conversion is absolutely brilliant.

'More and more games will drive the market and get the coverage.'

So how exactly should Acorn leap five years?

'The problem with Acorn is that it is identified with school, which is fine in itself but causes hassle with third-party developers. I can't see hip programmers like the Bitmap Brothers releasing an Arc game at the same time as the other formats, simply because the Arc doesn't have the cred. Acorn should look at Sega and copy its marketing strategy; the MegaDrive is a pretty poor machine compared to its rivals, but it's been marketed so well, it's selling in ridiculous numbers.

'It's all down to marketing. The games are appearing, and I saw some excellent original software at the show, like *Microdrive* and *Spheres of Chaos* – the potential is huge. Another bonus is that the Acorn games market is so cheap compared to consoles. You can pick up a really decent game for very little.

'However, the Arc's good in other areas too, like the video recording and editing with *Replay*. The Sega MegaCD has nothing on this, it's really block and grainy. *Replay* really adds to games, and that should be exploited. On the other hand, just adding video doesn't necessarily make a good game; you still need decent gameplay.'

Of course, the one to watch at the moment is 3DO, the new games console based on the Arm chip.

'3DO is the bees knees. Programmers are moving away from the Amiga market towards consoles because the A1200 is too little too late, and everyone who has seen the 3DO in action has come away drooling. Looks good for Acorn, if you ask me.'

So can we expect to see more Arcs on *GamesMaster*?

'Yes. If the games start to appear and we've not covered them before, I think you can.'

NEXT MONTH

● Hard drives come under our scrutiny next month, with a special look at those familiar problems of backup routines and data security.

Find out about a brand new application which not only allows you to partition your hard disc but can also hide certain areas of the disc from public view. Also, we will be testing out the latest application to make selective backups a far easier affair. But what is the best device to backup onto? We look at some of the options from the floppy to the tape-streamer to the magneto-optical drive.

● Have you ever taken a really close look at the icons that grace your *Acorn User* subscriber's disc? Ever wondered how we manage to pack so much artistry into such a tiny space?

Next month all will become clear as Jack Kreindler, *Acorn User*'s icon expert, shares the secrets of miniature design.

● Delve into the bargain basement of the software world. Public domain programs come to the pages of *Acorn User*.

● *UltiMode*, our ultra-quick utility, allows you to change screen mode in the desktop by simply pressing a key. Never again need you endure the long-winded task of mode changing.

UltiMode is available in our yellow pages, and of course on the monthly subscriber's disc. Begone dull palette menu.

● Next month the *Acorn User* team take a trip down to the local pub, play the entire population of a village at an adventure game called *Atavar* and much more besides. It's all going on at The Silicon Village...

● Confused by debugging? Can't get to grips with Basic commands? Don't know your bits from your bytes? If so, you need our new programming series.

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